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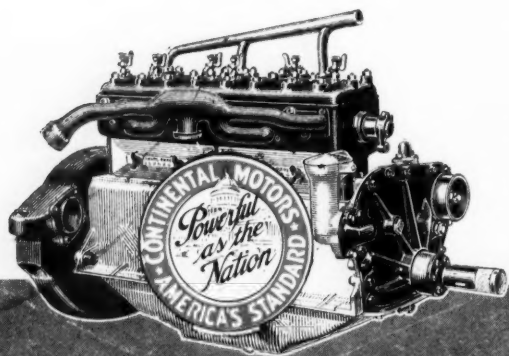
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AUTOMOTIVE INDUSTRIES

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NEW YORK—THURSDAY, SEPTEMBER 14, 1922

No. 11

Making Western Highway Programs Build Car Sales

Practical view of road building and finance problems will enable automotive industry to increase sales in far West. Chief MacDonald of Bureau of Roads, returning from recent trip, says road programs in Western States portend more extended use of cars.

By Norman G. Shidle

AUTOMOTIVE manufacturers should use their influence to prevent friction between local automobile organizations and state highway officials, since such open conflicts usually result in losses for both sides and in decreased benefits for the whole industry.

Every effort should be made to complete road programs in all the states during the present period, as business revival promises to put a strain on transportation facilities that cannot adequately be borne under present conditions. Greater highway mileage, especially in the Western States, will lighten this transport burden and will react very directly to the benefit of automotive manufacturers both in increased sales and in more efficient carrying of manufacturing materials.

Greater mileage of smooth, firm roads suitable for comparatively high speeds is the chief highway need of the Western States, where distances are incomparably greater than in the East. These roads need not be wide in many cases, so long as they permit operating speeds ranging from 30 to 40 miles per hour and are strung out over the greatest distance.

These are the chief impressions brought back by Chief Thomas H. MacDonald of the Bureau of Roads from a recent trip to a number of western states.

Correlating the impressions a recent motor tour through the long stretches of California, Arizona, Nevada, Washington and Oregon with a wide knowledge of highway problems in general, MacDonald is vividly impressed with the need for some very practical co-operation and effort by the automotive industry.

Local bodies of motor interests sometimes make strong opposition to plans of the State Highway Department, chiefly with a view to obtaining some special benefit for their local community. Such fights, when dragged into public, have a demoralizing influence on the progress of highway development and incidentally on automobile sales.

In several western states, for example, constructive highway programs have been laid out. These states now contain long stretches of country without transport facilities. If funds are provided to carry through the road plans during the next decade these states will be provided with highways which will result in vastly increased touring and make car sales mount more rapidly than ever.

At the present time, the state highway departments are waiting to see what the next Legislature is going to do. They are uncertain as to whether or not they will be permitted to carry through the necessary programs which have been mapped out. These programs

are not extravagant. They have been carefully planned with the co-operation of the Bureau of Roads and are laid out on a broad basis that will make for the development of highway transportation throughout the territories involved. It is to the interest of automotive manufacturers that these plans be put through.

Local fights, often centering about details, tend to increase the uncertainty of any adequate appropriation. Consequently, the automotive industry as a whole should throw its influence in favor of harmony on minor issues.

Present Work Sound

CHIEF MAC DONALD is convinced of the essential soundness of the road work planned by the highway departments of the states which he visited. While there is always room for difference of opinion as regards details, the work which these states have accomplished is remarkable, when everything is considered. MacDonald particularly approves the general idea of making appropriations produce as great a mileage of serviceable roads as possible. This is being followed in practically every case in the states under discussion.

The highway problem in these states is an intensely practical one and the automotive industry in lending its influence should not be too greatly concerned with theoretical considerations.

Highway building has been and should continue to be a development. It is useless to expect that the wearing surfaces built to-day are going to last forever. To build such surfaces under many conditions would be uneconomical to a high degree.

Take a State like Arizona, for example, where there are long stretches of desert country. The chief necessity there is for the greatest possible mileage of road constructed well enough to stand high operating speeds. The surfaced roadways need not be more than 10 ft. wide in many cases, as the traffic would not be dense for some time to come.

Many narrow roadways were built in California in the past. They are now being widened and improved where traffic demands. The foundation and everything else that has been put into them is being used in this improvement process. Nothing has been lost by the construction of a cheaper surface in the beginning. In the meantime many years of good service have been rendered by those roads to the motoring public.

Thus it is perfectly possible to build a road to-day in such a way that it will be economical and adequate for present requirements, without sacrificing its future usefulness as a basis for improvement.

Viewed over a long period of time, past efforts have not been at all bad. The man who built 10 miles of 8-ft. concrete surface over desert territory ten years ago was exercising better judgment than if he had built 2 miles of 20-ft. roadway. In building to meet present conditions the original 8-ft. surface can be used, so that the money originally invested has not been wasted.

This phase of road construction is specially important in the Western States, because of the great dis-

tances which have to be covered. The use and utility of the automobile will increase only in proportion as the facilities are given it for going long distances at comparatively high speeds.

As regards matters of highway finance, the automotive industry should take a very practical view, MacDonald feels. The industry is interested primarily in getting more good roads, as such roads will increase sales in certain territories more than any other single factor. It is useless, for instance, to say that motor vehicle license fees should not be used for road construction, but only for road maintenance. The fact is that these fees are being used for construction and will continue to be so used. Even the theory is not sound, according to MacDonald, because it is based on the assumption that a certain standard of road has been built in the first place.

It is perfectly possible, for example, that maintenance costs might be reduced by taking part of the motor vehicle money to enable the state to build a better quality road in the first place. It might be more sensible to do this than to insist that a poorer quality road be built with the funds available and the motor vehicle tax money used up in maintaining that poor road. He suggests even that the gasoline tax in California might have been advisable.

In all matters of highway finance, MacDonald advocates an intensely practical view, since the next few years are highly important in highway construction. The results achieved during that time will be of vast importance to automobile and truck manufacturers.

In his view of the use of motor vehicle tax money for road construction and on the possible usefulness of the gasoline tax in certain cases, MacDonald is at variance with the Motor Vehicle Conference Committee and many people in the automotive industry. His view is worth serious consideration, however, because of his wide experience and intimate connection with the highway problems of this country.

Motor Buses

THE bus will have a very distinct development in these Western States, MacDonald predicts. It is already widely used and its potential utility is very great. In certain instances companies are already operating buses over routes which would not be considered fit for passenger car travel in the East. The lines are being run simply on the strength of the future value of the franchise when good roads do come to that section.

The bus will be a distinct supplement to the railways when these long, hard surfaced highways have been connected through the desert areas. The bus can be used for sight-seeing and touring purposes to a very great extent and will take people over many beautiful touring routes after they have left the railway trunk lines. The bus will take the place of the short-line railway development which the East has had, but which the West has lacked.

The future of truck traffic in connection with the long,

CHIEF THOMAS H. MAC DONALD of the Bureau of Roads says:

The far West needs the greatest possible road mileage, built to carry cars operating between 30 and 40 m.p.h.

Car manufacturers should support the long, "fast" road programs which are being carried out in these states, as the completion of these plans means greatly increased sales.

Service creates a demand for better service.

Give a man some kind of road which will meet his immediate needs, and he will vote for a bond issue later to get the better road which he later needs.

The automobile manufacturer doesn't want to be judged to-day by the product he put out fifteen years ago. Neither does the road administrator.

"fast" highways is not quite so clear. The truck will undoubtedly be used as a feeder for the railroads, but it is too early to determine whether or not its service to the communities involved would be in proportion to the cost of building these fast highways to carry very heavy loads. In any case, there is a distinct future shown for the speed truck and freight-carrying vehicles of a similar capacity.

Chief Needs in Highways

The chief needs in highway development for these states may be summed up as follows:

1. Great mileage capable of carrying rapidly traveling vehicles.
2. Subjugation of local animosities to the development of a comprehensive state and inter-state highway development.
3. Roads built for needs of the immediate future with the idea of cumulative improvement in the more distant future.
4. Practical consideration of problems of highway finance and construction, rather than an attempt to maintain predetermined theories.

In summing up his views resulting from this western trip, MacDonald said:

"I was strongly impressed with the highway work which has been done by the states which I visited. In view of the vast distances which they have to consider in laying out a highway program, I think they have performed wonders. Their task is almost inconceivable to one familiar only with conditions on the Atlantic Coast and in the Middle West.

"In answering critics of some of the highway building of the past in these states, it is well to bear in mind the practical facts. Roads can be built only when money to build them is supplied. The only way to get a man to vote for bond issue for roads is to give him service from a road. If you build the best road you can with the funds given and spread it over the widest possible area, you are giving service to the greatest number of people. This service creates a demand for better service. Thus cumulative road improvement is made possible.

"The automobile engineer wouldn't like to be judged to-day by the product which he put out fifteen years ago. Neither does the road builder and road administrator."

Germans Fly for 2 Cents a Mile

"**E**VERY civilized government in the world that is not bankrupt, with the exception of the United States, is finding it worth while to develop aviation.

"German air lines total about 4000 miles, most of the distance flown once daily. The fare is astonishingly low. At the last of July, reckoning exchange at the rate that then applied, one could fly for 2c. a mile. The distance between Berlin and Hamburg is about 200 miles and the fare by air is only \$3.50. In addition to this, the government pays the commercial companies a subsidy of 8c. per airplane mile."

These are the statements made by Professor Warner upon his return from the French and German glider contests. Discussing the air situation abroad, Warner goes on to say:

"The safety factor of such travel is encouraging. So far as I know, there were only two fatal accidents in Germany this summer.

"Nearly all countries grant subsidies, the French being the heaviest and the English about the lightest. Even in Austria, in the last stages of financial collapse, a new air operating company is being planned. It has been shown that if a commercial aviation enterprise is operated solely as a commercial undertaking, without regard for possible military use, and applying the same methods of sound business management as would be required of any ordinary activity, there is every prospect that it can be made to stand on its own feet. As an example of what can be done, one English line during June made 84 trips between London and Paris, with only one airplane. This machine traveled a total distance of 19,000 miles, with only one forced landing and that due to fog. Twenty trips were made in five days, or an average of 900 miles each day, which meant about ten hours of flying daily. During all this, the advertised schedule was maintained. One English company is operating successfully without government subsidy.

"The record for safety is reassuring. Taking all the European lines, there has been one death for every 400,000 passenger miles. Some lines have made a much better record, one having flown 650,000 airplane miles without fatal accident.

"Aviation in England is the center right now of hot parliamentary controversy. The British feel very keenly the military necessity of proper air defense. The small compass of the British Isles makes aviation primarily a matter of imperial communication and it is being so developed. The military control of Mesopotamia is being turned over to the Royal Air Force. The chief commercial lines in England are between London and Brussels, where one company operated, and between London and Paris, operated by three. About ten ships are scheduled each way each day at the London air port. The rate is about 12 cents a passenger mile. The subsidy is not large and is on a basis of business actually obtained by the carriers.

"The French development is more largely for military reasons. Nine great routes are operated, including the London-Paris trip, which has two French companies; Paris-Brussels; Paris, Strassburg, Prague, Vienna and Budapest, and Toulouse-Casablanca, in Morocco. The fare is 8 cents a mile. The subsidy is the most elaborate in Europe and under some circumstances it is possible to operate and clear expenses without carrying a passenger."

Imports of Motor Vehicles Into Madras Presidency Decrease

THE value of passenger car and truck imports into the Madras Presidency decreased to Rs. 2,907,000 (\$969,000) for the fiscal year ending March 31, as compared with imports valued at Rs. 11,819,000 for the preceding year. The contemplated increase in the import duty hindered importations as much as the drop in Indian exchange and the general business depression. The number of passenger cars imported dropped from 1733 in 1921 to 425 in 1922, 193 of which came from Canada, 120 from the United States and 57 from the United Kingdom. Motor trucks declined from 265 to 160, the majority of which came from Canada, and consisted of light truck chassis for conversion into buses, a number of bus services having been started around Madras. Imports of motorcycles fell from 783 to 110—England furnishing 69 and the United States 19.

1,000,000 Motor Vehicles Built In Four Months

Many factors created this demand. Market promises to remain steady throughout year, with farmers gaining strength as buying factor. Industry must guard against undue plant expansion.

By James Dalton

AFTER producing over 1,000,000 motor vehicles in the past four months, the industry naturally is wondering what the rest of the year has in store. This speculation seems to be just as interesting to men in other lines and to the public generally. The perennial pessimists, with whom the wish is father to the thought, are shaking their heads and predicting dire disaster. A careful survey of the situation, however, discloses no serious cloud on the horizon unless it is the freight car shortage, which will reach record proportions in the next three or four months.

A good many people are asking where all the motor cars are going to and it's a hard question to answer. The fact remains, nevertheless, that they are going to purchasers and not into warehouses. Many explanations have been offered for the apparently insatiable market and probably all of them together give the correct reply.

There has been an increase of billions of dollars in the market value of securities, for one thing, and a large number of persons who felt themselves poor a year ago now have money to spend for the things they want. The tremendous increase in purchasing power resulting from the industrial revival has been another factor. The general improvement in sentiment and morale has made motor car purchasers of many thousands of people who clung grimly to their available funds while the country was in the midst of depression. Finally, good crops and higher prices for his products have brought the farmer into the market.

America has learned the necessity of the motor vehicle and its economic value. For that reason there is not and will not be any bottom to the market. There are a good many millions of potential purchasers who never have owned a car and there is an enormous replacement market.

Motor vehicle manufacturers are not underestimating their market for the remainder of the year nor are they

running wild by building in reserves of cars. Models must be changed frequently and it is unsafe to build up large stocks. Then, too, they have learned the folly of piling up huge inventories of finished and unfinished products. They are not likely to repeat the mistakes which proved so costly in 1920.

In any discussion of markets for the rest of 1922 the farmer must be given first consideration. He will buy more motor vehicles than seemed possible even six

months ago. As a matter of fact, generically speaking, the farmer is not as poor as he thought he was. He is naturally temperamental and given to brooding. When prices are not as high as he expects or crops not as large, he is prone to think he's ruined and positively refuses to spend money for anything not absolutely essential.

But the farmer as a class is not broke by any manner of means. He is going to have more money available this fall than he expected. For example, farmers in the South were supposed to have been hit harder than

those in any other section of the country, and yet the Federal Reserve Bank of Atlanta reports that the great majority of them in many sections of that district have paid all their bank obligations. If that condition prevails in the South it undoubtedly does in other sections.

Some motor car makers seem to have been a bit too conservative in their estimates of what farmers will buy the coming fall and it might be wise for them to revamp their expectations somewhat. The market in the agricultural regions is stronger to-day than it was expected to be and it will grow steadily stronger as crops are marketed. City sales, generally speaking, have fallen off somewhat but the market is not by any means dead and from the rate at which cars are selling it is evident that rural demand is fully counterbalancing any falling off in urban business.

Naturally, production cannot continue for the next four months at the pace of the past four. There must

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be a let-up sometime, but few persons expected August output to reach such huge proportions. Usually it shows the effects of the mid-summer slump, although it was the biggest month of 1921. Preliminary estimates of the National Automobile Chamber of Commerce show a total for the month of approximately 280,000, which closely approaches the record of 289,000 set in June. The total for August, 1921, was only 180,000. The figures for the last six months are simply astounding—March, 173,000; April, 218,000; May, 256,000; June, 289,000; July, 246,000; August, 280,000. They read more like a census table than a sales record.

The August showing is one of the most surprising of the year, but it is not difficult to explain. In the first place the market, especially in the rural districts, has been stronger than was expected. In the second place there naturally has been some concern on the part of manufacturers as to the effects of the coal and rail strikes. As a result some of them built, for the first time in months, a few more cars than actually were needed to fill current orders. It was felt, very wisely, that if the railroads were unable to move shipments at the usual speed, it might be wise to have a few more cars on dealers' floors or in transit to them.

This small excess of supply over actual orders was relatively small and by no stretch of the imagination can it be described as overstocking, or overloading dealers. Full consideration must be given for the rest of the year to the practical certainty of an acute freight congestion. Any attempt to build up a large reserve supply of finished products would be extremely hazardous, but good business men are forehanded and farsighted.

Business this fall is going to be very good for the latter part of the year. Demand for closed models is almost universally strong and it is hard to get deliveries in some of the more popular lines. This market promises to be steady throughout the year. It will be stimulated by the closed car shows which dealers all over the country soon will begin to put on. The market for open cars will continue to be good in the South and in the farm districts.

Speculation as to production for the year is more or less idle. It is not safe to hazard a guess of much more than 2,000,000 vehicles, about 10 per cent of which will be trucks. The total for this month will be pulled down sharply if Ford makes good his threat to close his plants Sept. 16, and there is no indication thus far that he has changed his mind. If his factories remain down for a month October production also will be adversely affected. It may mean that the record for the year will not equal that of 1920. It can be predicted safely, however, that production this month in plants other than Ford's will not fall very far below the level of August.

As a matter of fact, surface indications are that practically all factories have planned for a still larger output in September. Almost all parts makers report that their

specifications for this month are larger than they were in August. It is significant of the confidence felt by the industry that they have a reasonably large amount of business booked through until Jan. 1. Increased specifications for September include all classes of cars, from the lowest to the highest price fields.

September delivery probably has been ordered on a portion of these materials because of the prospective jam on the railroads, but most of it will be used in the production of vehicles to meet current demands. No hesitation need be felt in saying that business has held up much better than was expected and that no signs of a serious slump are in prospect.

Much interest is felt throughout the industry in the real reason for the impending Ford shut-down. Little credence seems to be placed in the explanation that it is due to a fuel shortage. Other plants, with far smaller resources than Ford, are getting coal. The only persons in the industry likely to suffer from a fuel famine are some of the comparatively small parts makers.

A good many persons profess to believe that there has been a sharp falling off in sales of Ford products and that he will close for a month to let them pile up because it is more profitable to run at full speed than at half speed. This theory also is discounted.

Ford is exceedingly close mouthed as to the purposes of what have been called his master strokes, but persons usually well informed about his plans see in the present move a political motive. They assert he has visions of the White House and believes that if he can break coal prices it will help him to get there. This

may or may not be true. It is entirely possible that he has no other purposes than that avowed in his statement when he announced his intention of closing his plants—a determination not to pay what he considers an extortionate price for fuel. He believes Wall Street controls the mines and he has no intention of paying tribute to Wall Street. He credits a certain section of Wall Street with having tried to break him, and not without justification.

High fuel prices will add a little more to the manufacturing costs of all vehicle makers. These costs have risen steadily, although not alarmingly, for several months. They will have at least one beneficial effect, in a period of sharp competition, for they will tend to stabilize prices. Any wise manufacturer will think several times before he will cut the prices of his products time after time when manufacturing costs are constantly going higher. It seems practically certain that price readjustments for this year are almost over.

A certain amount of planning can be done to meet the problems which will arise for the remainder of 1922, but most of them will be of a nature which must be met from day to day. Most of them will be bound up in the railroad situation and the constant effort which will have to be made to get coal.

No one can view with equanimity the situation of the carriers. Even if the shopmen's strike is broken or

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America has learned the necessity of the motor vehicle and its economic value. For that reason there is not and will not be any bottom to the market.

There are a good many millions of potential purchasers who never have owned a car and there is an enormous replacement market. That is the answer to the time honored question about reaching the saturation point.

settled almost immediately, nothing can avert a very serious car shortage. It already is being felt to a certain extent by automotive plants, especially in the Detroit district, but as long as warm weather lasts cars can be driven away from the factories, and not so much trouble has been experienced in getting parts and raw materials.

FULL effects of the car shortage will not be felt for another three or four weeks. By that time all coal carrying roads will be making frantic efforts to move fuel into the districts which need it most and at the same time handle enormous crops. In spite of denials made by the carriers, it can be stated that their rolling stock is in much worse condition than they are willing to admit. Unless they can man their shops with full forces of competent men for from 30 to 60 days before snow flies, there is serious reason to believe that a good many roads will practically collapse unless there is an unusually open winter.

It should not be forgotten, in spite of reassuring statements, that the fuel needs of the northwest cannot possibly be met at this late date, nor can those of New England. There will be much suffering in both sections the coming winter. Even New York will not begin to receive large supplies of anthracite much before Nov. 15.

Car loadings are significant of the demands being made on the carriers. The total for the week ending Aug. 26 was 890,838, the largest for any week since Oct. 1, 1921. It exceeded the same week last year by 61,955, but the coal loadings of 111,030 cars were 48,483 less than for the same week last year. The total for the week was only 110,470 less than for the same week of 1920 and it will be seen that coal constituted nearly half the difference.

Even under the most favorable circumstances, the rolling stock of the railroads is utterly inadequate to handle the business of the country when it is moving at full speed ahead. Much equipment has been ordered but it

will not be delivered in time to be of material help this year.

There is another factor in the situation which may cause trouble. It is based on the old question of priorities, essentials and non-essentials. It had been supposed that the archaic idea that motor vehicles are non-essentials had been vanished, but it seems to have risen again like Banquo's ghost. It may interest the industry to know that a representative of one of the principal components of the United States Steel Corp. recently informed at least one parts maker that he had been instructed not to accept orders from industries which had been classed as non-essential. The rank injustice of such a stand needs no argument when it is realized how great a part the automotive industry has played in hastening the return of prosperity.

So far as 1923 is concerned, it promises to mark the real beginning of a long period of prosperity, but the country will suffer eventually, as it did in 1920, if prosperity brings unwarranted inflation. There are reports from Detroit and other centers of the industry that numerous automotive companies are planning plant expansions. In some cases plant enlargement may be justified, but generally speaking a waiting policy in this respect will be wisest. It is not pleasant to have to refuse orders for lack of plant capacity, but it is much less disagreeable than it is to have a white elephant on your hands eating up your profits and that is what surplus factory space amounts to.

IT seems improbable that the market for passenger cars can be much larger in 1922 than it has been this year. The truck market is much more likely to expand materially next year. At any rate, caution will do no harm. If a manufacturer is sure he can continue indefinitely to market more of his goods than he can make he is justified in enlarging his plant. Unless he is mighty sure of it, however, he had best let well enough alone.

S. A. E. Progress in Standardization Work

THE standardization of gasoline railroad cars was discussed at the July Truck Division Meeting in consequence of a suggestion that had been received by the Society that a new Division of the Standards Committee be established to work on the standardization of this type of vehicle. It was indicated that the conventional truck chassis will be the basis for the construction of gasoline railroad cars, rather than gasoline power-plant equipment being adapted to typical railroad car construction.

There was a considerable discussion as to whether railroad or automotive engineers should carry on such standardization work, general opinion indicating that the automotive engineers should do so; also that, if the work is undertaken, a separate Division should be established.

Motor Bus Bodies

It was suggested at the last Truck Division meeting that the standardization of mounting dimensions for motor bus bodies be studied, but it was thought that it is too early in the development of this type of vehicle to undertake such standardization.

Motor Truck Cabs

At the July meeting of the Truck Division H. B. Knap, of the Packard Motor Car Co., was appointed a Subdivi-

sion of one to prepare a report on the standardization of motor truck cabs. Tabulated dimensions showing present practice as to cab construction was turned over to Mr. Knap for use in this connection.

Motor Truck Rating

In response to demands from the highway authorities of the State of Connecticut, a meeting was held at Detroit on July 24 to discuss the formulation of a "yardstick" of gross carrying capacity and safe operation of motor trucks for administrative use by licensing and law enforcement officials that can be definitely determined by the manufacturer, buyer and the law enforcement official. This meeting was attended by members of the Truck Division, a representative of the National Automobile Chamber of Commerce and representatives of various truck builders.

It was felt that there is a definite need for a rating and that the essential elements to be considered are the strength and ability of steering gears and of brakes and the strength of the axles. It is considered that these three factors are the important ones in determining the safety ability of a truck on the road and that all are equally important. A subdivision, consisting of A. K. Brumbaugh, chairman; D. C. Fenner and A. J. Scaife, was appointed to submit the suggestions of the meeting to the manufacturers for their consideration and comment.

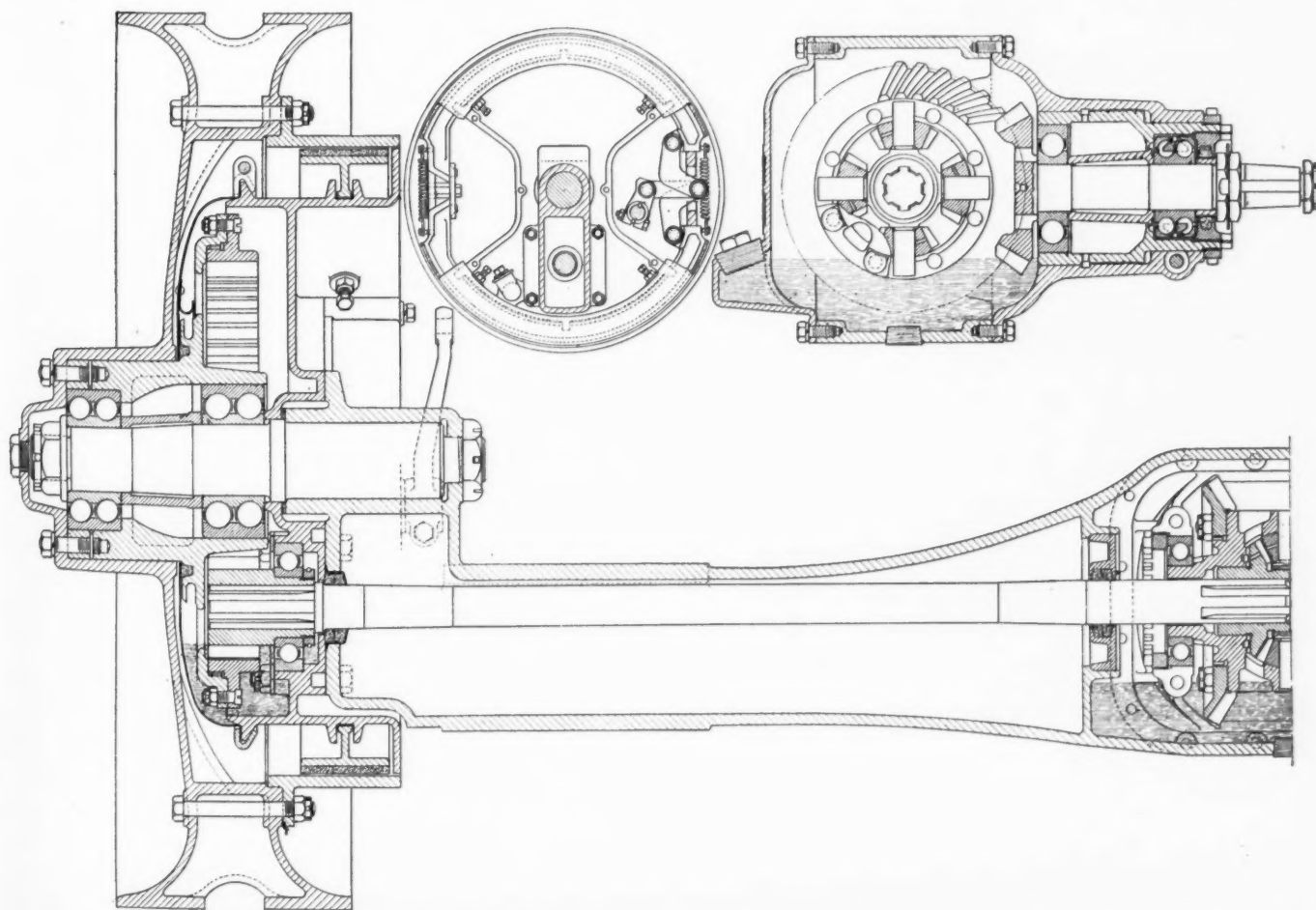
A New Rear Axle Designed for Motor Buses

Is of internal gear cranked type with live axle below the center line of the wheel spindle to enable use of a low frame without kickup. Method of retaining ring gear lubricant is interesting.

THE growth of bus transportation is being reflected continually in the announcement of parts makers regarding parts made especially for bus chassis. Among such parts which have recently come to our notice is the rear axle illustrated in the accompanying cut. This, it will be noted, is of the internal gear cranked type. The entire central housing is a one-piece malleable iron casting of oblong box section with the long axis in the vertical plane. The live axle is enclosed within the box section which is designed to take both bending and torsional strain and with a view to securing minimum weight. The driving pinion is in the lowest point of the gear circle and this arrangement, in conjunction with the flattened differential housing, affords good floor clearance above the differential as well as sufficient ground clearance. With 36 in. wheels

and 24 in. frame height, there is 8 in. ground clearance and $6\frac{3}{4}$ in. clearance between a 1 in. floor and the differential without frame kick up or underslung springs. This is said to permit of the use of a straight frame and to bring the spring eye in approximately the same plane as the center of the wheel. The axle is designed for 72-in. tread and $51\frac{1}{2}$ -in. spring centers.

The differential and the spiral bevel gears, as well as the driving pinions and internal gears, are arranged to run in heavy oil. The outer enclosure of the ring gear is in the form of a saucer shaped stamping which is clamped to the rim of the brake anchor disk by a V-shaped clamp ring held together by a single bolt. At its inner circumference this diaphragm bears against a felt washer which is said to be necessary only for the purpose of excluding dust and



Sectional view of Atlas motor bus internal gear cranked type rear axle

dirt. Oil, which is carried up by the internal gear, spills into a trough riveted to the upper part of the diaphragm and is returned to the lower part of the casing. Oil which escapes the trough is caught in a groove in the circumference of a flange on the inner wheel hub and is thrown off by centrifugal force. Oil is introduced through a plug filler spout in the brake anchor disk.

Special attention has been given to the matter of accessibility. The entire differential assembly can be removed as a unit from the front and a detachable cover plate at the rear provides for bevel gear and pinion adjustment. Wheels, with the hub cast integral, can be removed by taking off the nuts and the driving studs and inserting a 1-in. bolt in the center of the hub cap as a wheel puller. The wheel comes off without disturbing any bearings or the internal gear lubricant. When the wheel is off, removal of the diaphragm clamp bolt and diaphragm discloses the driving gears. The internal gear and inner hub can then be taken off by removal of the wheel spindle nut which exposes the driving pinion and allows the pulling of the driveshaft.

Internal Brakes

The internal expanding type brakes have 3 in. face and 21 in. diameter. The designers of this axle count upon the use of a propeller shaft brake and consequently provide only one pair of brakes on the wheels. This brake, as will be seen from the drawing, is actuated by toggles. The anchorage is at the front or point of application and consists of a cast boss on the brake anchor disk against which the ends of the brake shoes bear. The tendency of the shoe to revolve with the drum when the brake is applied brings the shoe against the anchorage at the farthest point on the periphery without regard to the direction of rotation. This is said to give a full wrapping brake which

bears at all points on the periphery. The toggles are so arranged as to pull toward the center. This is claimed to result in better distribution of wear and to entirely overcome the tendency to wear more rapidly at the points of the shoes. Adjustment for wear is accomplished by means of a wedge block located at the junction of the rear ends of the shoes.

Cast metal wheels designed and manufactured by the Atlas Axle Co., which concern is also the manufacturer of the axle described above, are furnished with the axle. These can be arranged for either 36 x 7 or 36 x 8 in. solids, with the felloe machined to take a cushioning element, or to receive 36 x 6 in. dual pneumatic tires. The brake drums are of special high carbon steel (0.65 carbon) and are claimed to be superior to pressed metal drums in wearing qualities.

The differential used is made especially for the purpose by the Brown-Lipe-Chapin Co.

Differential Gear

The differential gear and pinion are 3½ per cent nickel steel with hardened teeth. The pressure angle is 20 deg., the spiral angle, 29 deg. 19 min., and the pitch, 3.4. The internal gears are splined to the inner hub flange, are 4/5 pitch and 20 deg. pressure angle and have 1¼ in. space. The spur pinion is carefully fitted on the spline drive shaft, the splines extending the entire length of the hub.

The axle is being brought out in two sizes, model LC 8, 8000 lb. capacity on spring pads and model LC 12, 12,000 lb. capacity. The former is suitable for average 25-30 passenger single deck buses and the latter for the double deck buses. Model LC 8 is designed for a maximum allowance engine torque of 190 lb. ft., is provided with standard 6.6 to 1 gear ratio and weighs approximately 1100 lb. complete with wheels.

Average Gasoline Increases in Volatility in U. S.

FOR several years the Bureau of Mines has conducted surveys to determine the changes in motor gasoline being sold throughout the United States.

The present survey shows that for the districts in which samples were collected the average gasoline is becoming more volatile instead of less so, as is sometimes supposed. This year's gasoline is much more volatile than that sold two years ago, and it has a somewhat better distillation range than last summer's samples.

A comparison of the average figures for several years shows that motor gasoline is also becoming more uniform in character. The large seasonal change is disappearing, but "winter gasoline" still has a lower initial boiling point than "summer gasoline." This difference in volatility is made intentionally to facilitate starting the motor in cold weather. The end point shown in the present survey is slightly lower either than that of last winter or of the summer of 1921.

The average of the entire country considered as a whole does not show much change from a year ago, but samples from individual cities show some distinct changes. In Denver, for instance, the initial point is lowered 15 deg. Fahr., the 90 per cent point 14 deg. Fahr. and the end point 21 deg. Fahr., whereas the 20 and 50 per cent points increased 11 deg. Fahr. and 13 deg. Fahr. respectively. This change may be due to the fact that Denver receives

gasoline from one group of refineries at one period, and from another group at other times. Of 132 samples collected in the present survey, 10 failed to meet Federal specifications (adopted Nov. 25, 1919), as regards the initial boiling point of 140 deg. Fahr., and 61 samples failed at the 90 per cent point (374 deg. Fahr.).

Motor Taxes Opposed in France

AUTOMOBILE manufacturers and dealers in France continue their aggressive campaign to remove discriminatory taxes from the industry. A brochure has been sent to all Senators and Deputies in France by large automobile manufacturing firms, asking the cancellation of the 10 per cent luxury tax on automobiles.

It is also reported that an American firm manufacturing magnetos is developing a good business. The American Consul at Calais reports that the demand for automobiles, especially for commercial trucks, is improving in Calais, France. Like many other French cities, Calais is suffering from financial depression, in spite of which, however, there will be a good demand for industrial motor vehicles, and to a smaller extent, for pleasure vehicles. American cars are held in high esteem and manufacturers should quote prices c.i.f. Calais, as prospective buyers want to know what the first purchase will cost them.

Advantages of Evaporating Type of Cooling System

Promises to be lighter, simpler and more efficient than conventional types using thermostatic control. Is less likely to permit overheating and loss of water. Smaller radiator can be used, while temperature control is inherent. Positive pumps employed.

By A. Ludlow Clayden

WHILE discussions on cooling have mostly centered on the direct air system as compared with water cooling, there is rapidly growing interest in an intermediate system which theoretically appears to have some of the advantages of both, plus certain good points entirely peculiar to itself. This is steam cooling which could perhaps better be described as the "evaporation system."

No example of this system is in actual use in production, but several have been experimented with to a considerable extent. It is known that the patent applications recently made by various parties have shown some conflict and that there is argument about priority of idea, but actually it appears that several quite independent experimenters arrived at similar conclusions, at times almost coincident.

The only system of which all details have been made public is the Rushmore system described in *AUTOMOTIVE INDUSTRIES* last year. This has been improved in detail and will be dealt with directly. It is a well known fact that several other experimental systems exist, but the patent situation regarding them has not yet reached the stage of development that makes publication of descriptions possible.

However, in all steam-cooling systems the basic idea is to make use of the latent heat of steam, to allow boiling in the engine jacket, under conditions which will not give the effects of "overheating" and to use the radiator as a condenser. The fundamental advantage common to these systems is that they provide a constant jacket temperature without any form of thermostat and give a mean radiator temperature hotter than is obtainable with a water system, which means that the rate of transfer or rapidity of cooling is greater. There are also many lesser advantages.

Before entering on the description, however, one common misconception should be dealt with. This is that deliberately boiling water in the engine will produce the effects of overheating such as warped valves,

poor lubrication, spark plug troubles and so on. It should be necessary only to point out that the temperature of the cylinders in air cooled engines is far above anything existing with steam cooling and that overheating effects arising from a boiling condition of a water system are due to the temporary stoppage of circulation, as described in a previous article. Such stoppage allows valves and such parts to get far hotter than in any system where the formation of steam is deliberately sought and controlled. This is why evaporation

cooling seems perhaps better than steam cooling as a name. However, it is too late to change the name and the misconception will become of small importance if any of the steam systems come into use.

In writing on the water flow characteristics of radiators, in a previous article, it was mentioned that turbulent water parts with heat more readily than water flowing smoothly, and it was suggested that water flow in an engine jacket was always slow compared with the velocity necessary for turbulence. When heat is being supplied to any part of the cylinders faster than the

slowly flowing water can remove it, steam must be formed. If the system were previously filled with water such steam must displace water with the result that there will be ejection from the overflow.

There are two other effects less precise in character, but probably even more important; admittedly theory, but theory with a fair amount of evidence back of it. Steam bubbles tend to cling to the rough surface of the cylinder casting, and as soon as a bubble forms and clings no more heat is abstracted from the part of the iron it is touching, this heats up adjacent areas of iron and so stimulates the more and more rapid formation of steam around that area. Formation of considerable volumes of steam are thus made possible. Not only do steam accumulations of this kind allow the area of iron beneath them to become very hot, but the intermittent formation and break away of large bubbles causes seri-

STEAM or vapor cooling systems appear to possess many of the advantages of both the water and air types. No thermostats are required and the radiator can be smaller than the usual water type. This is said to make the steam systems lighter, simpler and cheaper than the conventional type, while the advantages of constant jacket temperature are preserved.

The subject will doubtless receive an increasing amount of study in the near future.

This is the third of Mr. Clayden's articles on cooling systems. The concluding article dealing with air cooling will appear in an early issue.

ous disturbance to the flow of water throughout the system. For example, there may easily be perceptible pressure existing in the top tank of the radiator. In most cases the outlet from radiator to pump is a restriction, so the pressure head on the water cannot greatly accelerate the downward flow of water through the radiator, but it can back up against the water coming from the engine.

High Temperature in Water Systems

It should be mentioned here that careful tests on an engine of high engineering standard showed the maximum temperature existing anywhere in the jacket to be 225 deg. Fahr. with outlet water just below the boiling temperature, but that directly steam began to appear in the cylinder outlet pipe the maximum jacket temperatures in restricted areas jumped to over 400 deg. Fahr., this proving that after boiling began water was unable to get to the hot areas except in very small quantities. After the formation of the first bubble of steam, when it broke, the iron under it was so hot that the water contacting in its place was instantly flashed into steam again. Probably the size of the successive bubbles would show rapid increase.

Now steam under the conditions described is forming under water and, when it does break through the

the system's normal operation being interfered with by the steam. In evaporation systems it is believed, on good grounds, that the size of bubbles is very minute and that the mean temperature of the cylinder iron is very near the maximum temperature of any point in it.

So far as they are known to the writer the fundamental principle of each of the systems other than Rushmore's is the same. The radiator is empty except for a small amount of water in the bottom tank. The cylinder jacket is filled, and kept full, by a positive pump which maintains a predetermined level in the jacket, the excess returning to the tank. There is direct connection between the top of the jacket and the top tank of the radiator. Thus the small amount of water heats up very rapidly—a matter of a minute or less to get a good working degree of heat. As soon as boiling begins the steam rises free and unobstructed from the water surface and passes to the radiator where it condenses, flows down into the lower tank and again enters circulation.

Upon this basis considerable detail can be and has been built. Methods for keeping the radiator free of air pockets, methods for controlling the degree of plus or minus pressure within the system and thereby the boiling point and mechanical details are the subject of applications now in the patent office. The details which the writer has actually seen are mostly simple, rugged and inexpensive. Without disclosing any of them it may be said that there is no difficulty whatever in providing a steam cooling system which will give a mean jacket temperature of 160 deg. Fahr. or even less if desired.

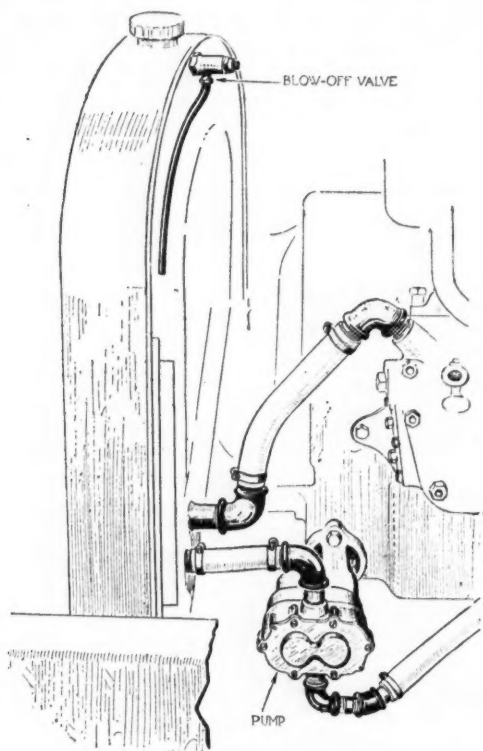
The Rushmore system differs materially from other systems in the same class. In it the jacket design is unchanged and a very small positive pump of gear or piston type is substituted for the centrifugal. Like the other systems, it uses an empty radiator, but the outlet from the cylinder jacket goes to the *bottom* tank instead of to the top. At starting the cylinder jacket is full of water and also the bottom tank; the radiator core and the top tank are empty.

How Rushmore System Operates

Suppose the top of the radiator open to the air. The warming up will occur quickly, water circulating from the bottom tank, through the jacket, back to the tank and round again. As soon as steam begins to form it has only one outlet, since it cannot back up against the water being continuously forced in at the bottom of the jacket. Hence a mixture of water and steam is driven down the outlet pipe to the bottom tank. Within this tank is a cross tube pierced with many small holes above and below. In this the steam and water separate, the steam emerging in bubbles or jets from the upper holes. Immediately on its escape this steam comes in contact with the empty radiator core into which it will rise until the cold metal has condensed it, whereupon the water will trickle back to the tank and return to the jacket to be reboiled.

Remembering that the top tank is assumed to be open, it follows that the steam rising into the core from the bottom will easily drive the air ahead of it. Actually normal running may call for about one-fourth of the total radiator capacity to condense the steam formed and operating under this condition; the bottom quarter of the radiator will be working as the condenser and the remaining three-quarters will be cold and full of air, the air having no tendency to mingle with the steam. The steam displaces air till enough of the radiator is cleared.

Under such conditions boiling will, of course, take place at 212 deg., the amount of the radiator in use



Diagrammatic view of Rushmore system showing positive pump, blow-off valve and radiator connections

water restriction surrounding it, it is merely a nuisance, there are no means for condensing it except splashing water itself very near the boiling point. The evaporation cooling systems, on the other hand, both encourage the breaking away of the steam (which is the same as discouraging the formation of large bubbles) and condense the steam formed directly it breaks free. The point especially to be grasped is that the size of the bubbles formed when a water system boils is quite large and consequently parts of the cylinder get very hot indeed. The dimensions of the bubbles are due to

varying with the power output. As stated in an earlier article, on a passenger car average running will heat about 25 per cent of the total available surface, the remainder being in reserve for automatic requisition for hill climbing.

In this system the formation of large steam pockets is prevented by the forced water flow and the continuous separation of steam from water. Judging from the operation of engines on the road the temperature condi-

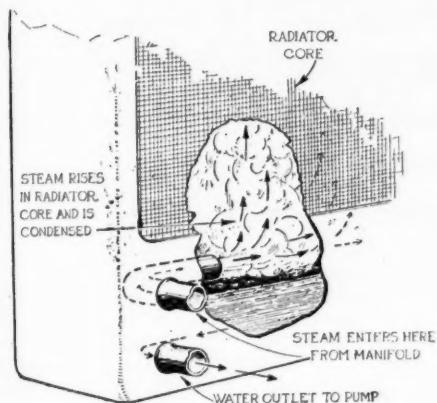


Diagram showing flow of water and steam in the base of radiator used in the Rushmore system

tions within the cylinder are comparable to those obtaining with a water system controlled to 189 deg. Fahr. outlet. There is no evidence whatever of the existence of the hot spots in the cylinders always noticeable in a water system when boiling.

This was the earliest stage of the Rushmore system. Actually it is not open freely to the atmosphere, but the top tank is supplied with a relief valve blowing off at 4 or 5 lb. pressure. This gives a boiling point slightly above 212 deg. Fahr., but the effect of the valve is more than that. Starting up with the normal quantity of water and with the radiator filled with air, no cooling will occur until the steam begins to force air out through the valve. The system will operate at approximately 220 deg. Fahr. consistently until all the air is displaced, which will not happen unless a hill or some other call for full power brings nearly all the radiator surface into play.

On reducing power after such a condition there will be a radiator filled with steam instead of air. The steam condenses promptly and so reduces the pressure; as the valve is a blow-off of the non-return type. From that point onward, till air is again deliberately or accidentally let in, the vacuum will vary and the boiling point with it. In actual practice the jacket temperature fluctuates from a minimum of a few degrees under 212 up to a maximum of about 220 deg. Fahr.

Smaller Radiators Possible

There are some peculiar advantages in the Rushmore system which deserve particular mention. Firstly, the high temperature of whatever part of the radiator is working, means maximum heat transfer. With water cooling and a mean radiator temperature of 160 deg. Fahr., with air at 80 deg. Fahr., the mean difference is 80 deg. With Rushmore's system the working surface is never cooler than 210, which means a difference of 130 deg. Fahr. and a consequent increase in radiator efficiency of over 60 per cent. Second, if alcohol is added in winter to prevent freezing, it will be condensed automatically. The alcohol will boil out of the water before steam forms, of course, but it will act precisely like the steam, being condensed in the radiator and recirculated. Since the system is closed there is no loss of alcohol by evaporation.

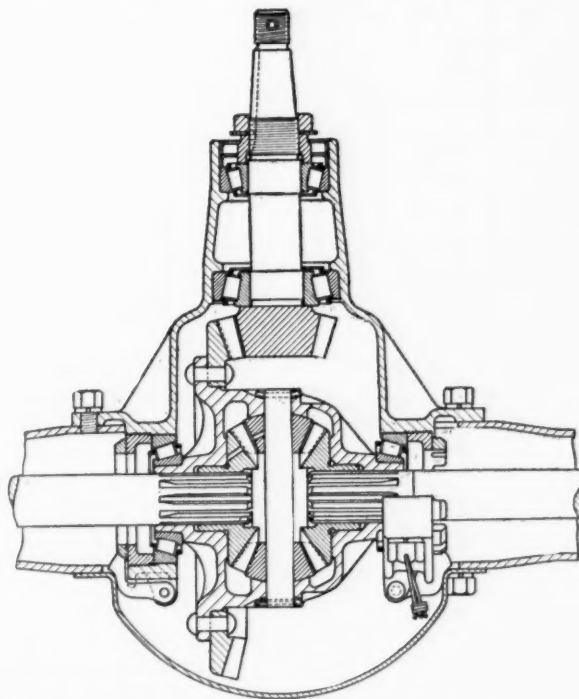
But perhaps the most important feature of all is that the admission of steam at the *bottom* of the radiator makes the air displacement automatic so that the system needs only one very simple and small pump. Also the high average radiator temperature and high rate of transfer means a small radiator and consequent economy in first cost. Finally, the smaller radiator and the small pump economize both weight and power. One advantage of the bottom admission also is that the water has no greater distance to trickle back than the steam rises within the core, so that even in the coldest weather, there is no possibility of the water freezing after it is condensed, so long as the engine is running.

It may be added that the Rushmore system can be arranged with a water filler actually on the bottom tank, but that the customary top cap can be used since, if too much water is put in, it is merely blown out just as the air is ejected.

Steam systems appear really likely to show perceptible economies in weight and in power required to operate them, while also providing a nearly perfect constant temperature control of fully automatic sort, with an extremely simple release valve as their most intricate part. They are so simple that their principle can be grasped at once by the least intelligent of operators. When closed, as in the type described, loss of water is less likely than with a water system and when the water is too low the effects are precisely similar to the conventional system.

Considering everything the steam system has all the earmarks of a better article for slightly lower cost and as such should be worthy of very serious consideration indeed.

Star Axle Drawing Correction



HEREWITH is shown the sectional view of the axle used in the Star car. This will correct the error made in AUTOMOTIVE INDUSTRIES for July 27, which due to an artist's error showed ball bearings in place of the new Timken short series tapered roller bearings, which are used for the pinion shaft, differential and wheels.

Lower Power Losses in Cord Tires Account for Longer Life

Relative importance of factors governing the loss of power in tires are here given. The loss is much less in the cord than in the fabric type. It increases with increase in load on the tire and with decrease in inflation pressure and is proportional to speed.

By W. L. Holt and P. L. Wormeley*

THE Bureau of Standards has undertaken a general investigation of automobile tires and inner tubes, and in connection with this work a rather comprehensive program has been laid out for dynamometer tests, to study among other things the power losses or energy dissipated as heat in tires operated under different conditions of axle load, inflation pressure, speed, temperature, and tractive effort. Preliminary tests have been made to determine the influence of these factors, which, aside from matters of design, are the principal items affecting the power loss in a tire. A continuation of the work will involve problems of design and construction, the influence of "over size" tires and of "cord tires" on power losses, mileage, and general efficiency of operation. An investigation will be made of inflation pressures as affecting the efficiency and economy of tire operation. Tests will be made to determine the effects of tire fillers, shields, puncture-proof tubes, etc., and the properties of cushion tires will be studied.

The equipment used included two Sprague electrical absorption dynamometers having a capacity of 20 hp. at 600 r.p.m. and 10 hp. at 150 r.p.m. One dynamometer is operated as a motor carrying on its shaft a wheel and the tire to be tested. The other dynamometer is operated as a generator carrying on its shaft a smooth straight face iron drum 40 in. in diameter. The motor is mounted on a movable carriage, the arrangement being such that by the application of weights to a bell-crank lever the tire is forced against the drum with a pressure corresponding to the desired axle load. In this way the tire and drum constitute a friction drive by means of which the motor drives the generator.

*The authors are connected with the Bureau of Standards. This article is slightly condensed from a report issued by the Bureau in the form of Technologic Paper No. 213.

DATA given in this article should be of much interest to engineers in the automotive industry. They tend in general to confirm the results of earlier tests made by Prof E. C. Lockwood (See *Automotive Industries*, issue of June 8, 1922, p. 1236-38) and others, but gives additional information on some points which have not formerly been covered, such, for example as the difference in the loss as between a tire which is only rolling and one which is driving or transmitting power.

The decreased loss in cord as compared to fabric tires accounts in large part for the longer life of the cord type. It also makes a car equipped with cord tires easier rolling than one with fabric tires and this difference is reflected in an appreciable saving in fuel—a fact which might well be used more than it has been in promoting the sale of cord tires.

The revolution counters are so designed that they can be read to the nearest one-tenth revolution of the tire or drum.

The inflation pressure is measured or changed while the tire is running, as follows: The tire valve, with the inside parts removed, is connected by a small tube to an attachment on the hub which communicates through a gland with a stationary chamber. This chamber is provided with a needle valve for closing the air passage leading from the tire, a standard tire valve for inflating or deflating the tire, and a connection for a tube leading to a pressure gage.

The correction for windage of the wheel and tire is determined by noting the scale reading at various speeds with the tire out of

contact with the drum. This is a minus correction. The correction for windage of the drum is determined by running the generator element as a motor and noting the scale reading at various speeds. This is a plus correction. The value of the windage corrections is very small. For example, the average corrections for a 33 x 4 tire run at 25 m.p.h., including both motor and generator, are equivalent to about 0.03 hp.

The power loss in a tire is given by the equation:

$$HP_1 - HP_2 = \frac{T_1 N_1 - T_2 N_2}{4000} \text{ (horsepower)} \dots\dots\dots (1)$$

where T_1 = scale reading of motor element in pounds (corrected for windage),

T_2 = scale reading of generator element in pounds (corrected for windage),

N_1 = r.p.m. of tire,

N_2 = r.p.m. of drum.

Length of dynamometer arms = 15.756 in.

This loss is due partly to deformation of the tire and partly to slip. The part due to deformation represents

SIDE GUIDE AND CHART

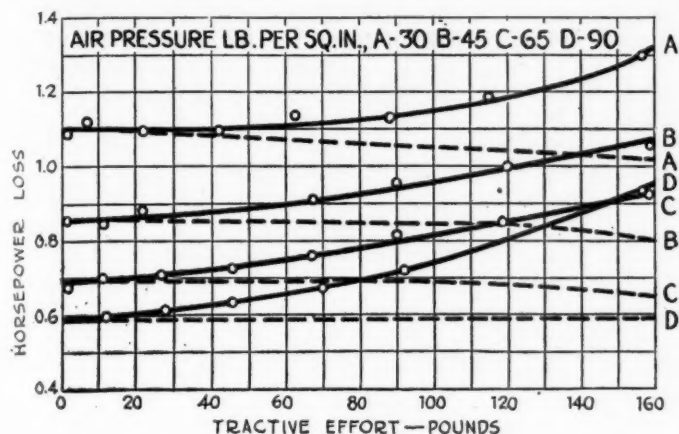


Fig. 1—Influence of tractive effort on power loss in a 33 x 4 in. cord tire, running at a speed of 25 m.p.h. and carrying an axle load of 885 lb. Inflation pressure is shown by figures on the respective curves. Total power loss is shown in full lines while dotted lines show the loss corrected for creep and slip as computed from equation (4)

heat developed in the tire, and the part due to slip represents heat developed at the surface of contact between tire and drum. The loss due to deformation of the tire may be viewed as consisting of two parts: (1) That due to a radial force (axle load) and (2) that due to a tangential force (tractive effort). The loss resulting from axle load is indicated by rolling resistance, which is defined as the resistance to turning (measured at the drum surface) which the tire would offer if there were no tractive effort. An approximate value for this loss is obtained by substituting in equation (1) values of T_r , T_s , N_r , and N_s , observed when running the tire with no load on the generator.

When there is a tractive effort, the tangential compo-

nent of the drum's reaction against the tire acts as a drag on the tread rubber. This tangential force has the double effect of compressing the tread rubber circumferentially just before it comes in contact with the drum and of producing a shearing action between the tread and carcass, with a corresponding circumferential or angular deformation of the carcass. This circumferential deformation of the tire produces creep in a manner similar to the creep of a belt on a pulley, since the material of the tire approaches the point of contact with the drum under compression and leaves it under tension. Portions of this surface of the tire are slipping on the drum, but it is probable that this slipping is confined to the ends of the surface of contact. The difference between the circumferential speed of the tire and drum is therefore more in the nature of a "creep" than what is ordinarily considered a "slip." If the tractive effort were increased sufficiently to produce "spinning" of the tire, the effect could more properly be called a "slip." The cushion forms an elastic bond between the tread and carcass and has its effect in producing creep, although this effect is not susceptible of measurement separately.

It is impossible to measure separately the losses due to creep and slip, but the sum of these losses may be approximated as follows: The pitch circle of the tire is defined as that circle which has the same linear velocity as that of the drum's surface when there is no tractive effort. We have therefore the relation—

$$\frac{r_1}{r_2} = \frac{n_2}{n_1} \dots \dots \dots (2)$$

where r_1 = pitch radius of tire in feet,
 r_2 = radius of drum in feet,
 n_1 = r.p.m. of the tire,
 n_2 = r.p.m. of the drum.

This equation is true, assuming that the slight tractive

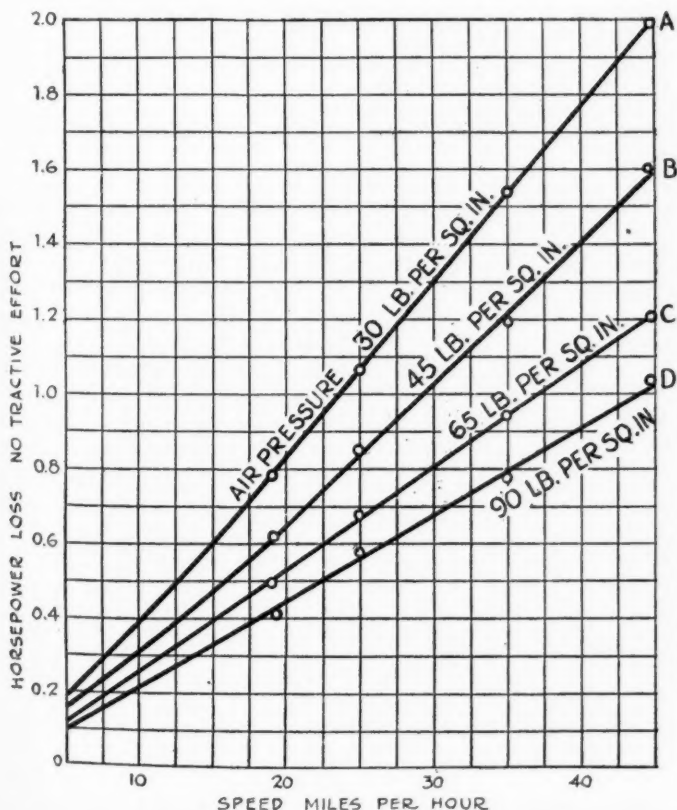


Fig. 2—Relation between power loss (rolling only) and speed in a 33 x 4 in. cord tire with 885 lb. axle load inflated to the pressure indicated

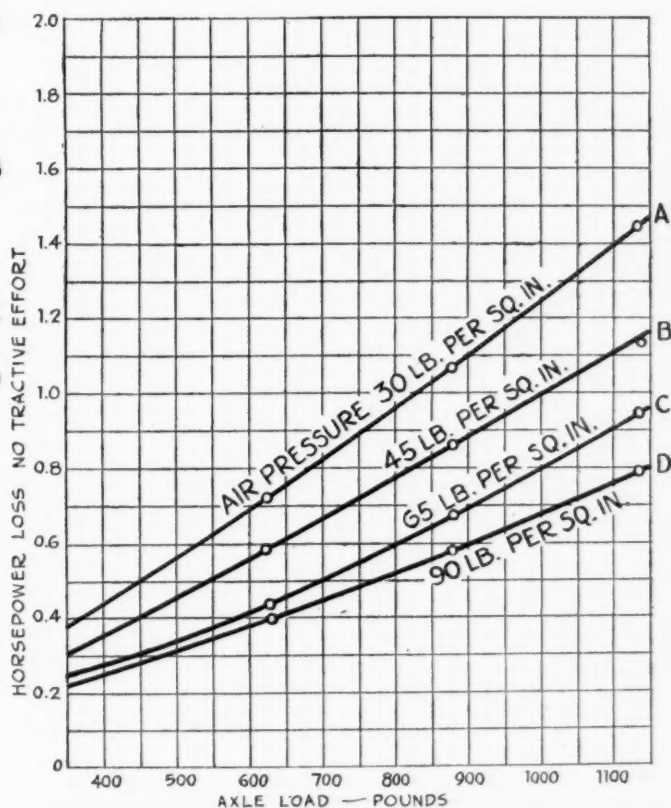


Fig. 3—Influence of axle load on power loss at 25 m.p.h. in a 33 x 4 in. cord tire inflated to pressure shown

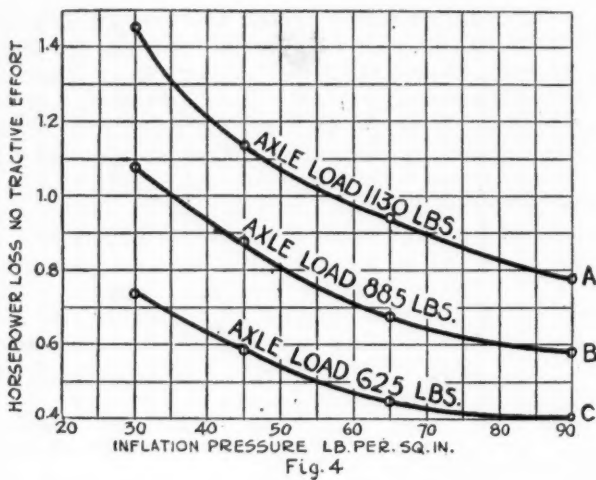


Fig. 4

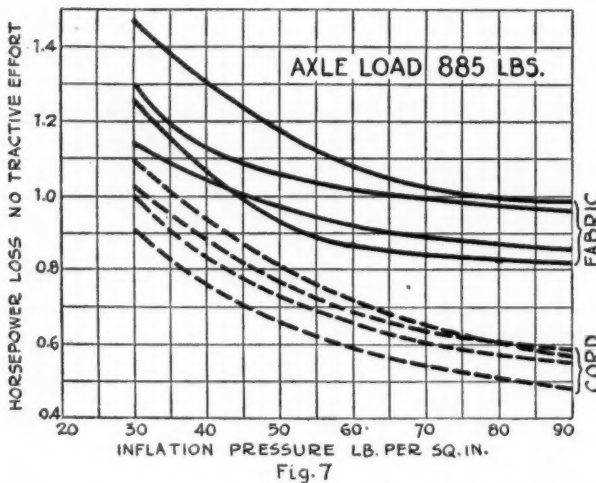


Fig. 7

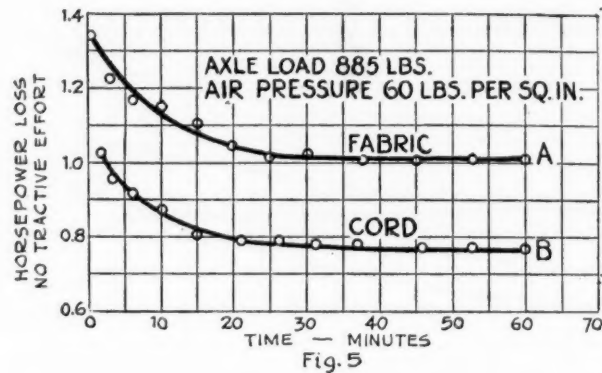


Fig. 5

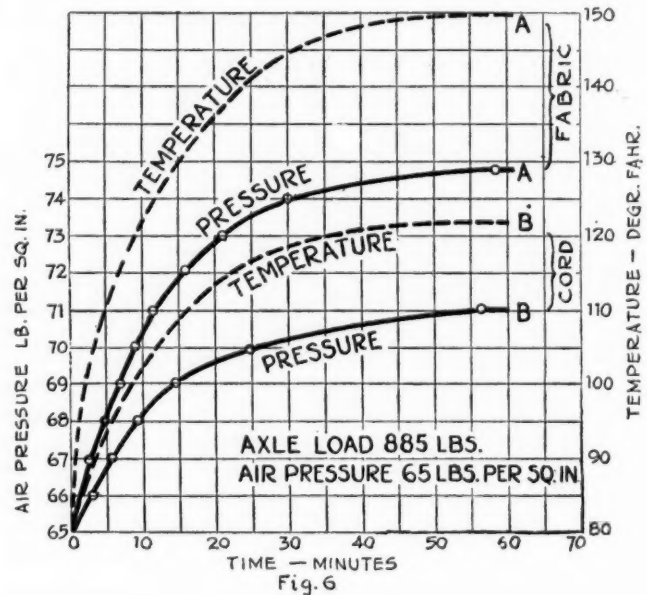


Fig. 6

Fig. 4—Effect of inflation pressure on power loss, at 25 m.p.h. at axle loads noted on curves

Fig. 5—Influence of temperature on power loss. The loss decreases as the tire becomes heated but assumes a constant minimum value when the temperature becomes constant

Fig. 6—Rate and amount of temperature and pressure increase in 33 x 4 in. tires running at 25 m.p.h. and carrying 885 lb. axle load

Fig. 7—Comparative power losses at different inflation pressures in four cord and four fabric tires, all 33 x 4 in. size, running at 25 m.p.h. with an axle load of 885 lb. The loss in the fabric type is about 40 per cent higher than in the cord type

effort (about 2 lb.) which is introduced by friction in the generator is not appreciable.

If the observed speed of the drum is n_2 r.p.m. when the tire is run under traction at a speed of n_1 r.p.m., we have

$$\begin{aligned} \text{Creep and slip} &= 2\pi \frac{(r_1 n_1 - r_2 n_2)}{2\pi r_2} \\ &= n_1 \frac{r_1}{r_2} - n_2 \text{ (r.p.m. of the drum)} \dots (3) \end{aligned}$$

The corresponding power loss due to creep and slip is

$$HP_s = \frac{T_2}{4000} \left(n_1 \frac{r_1}{r_2} - n_2 \right) \text{ horsepower} \dots (4)$$

Results of Tests

Fig. 1 shows the effect of tractive effort on the power loss at different inflation pressures. (This tractive effort is taken as the resistance at the drum surface as calculated from the generator scale reading) The total power loss as computed from equation (1) is shown in full lines. The dotted lines show the loss corrected for creep and slip as computed from equation (4). The sum of the creep and slip and the resulting power loss increase with the tractive effort, the rate of increase becoming greater as the tractive effort becomes greater.

It appears that for a well-inflated tire the loss corrected for creep and slip, as shown in curve D, is constant, that is, independent of the tractive effort and is equal to the loss due to rolling resistance as measured under no tractive effort. The total loss, as would be expected, increases with the tractive effort. The results at lower inflation pressures as shown in curves A, B and C, follow the same general trend except that the corrected loss decreases as the tractive effort increases. This decrease under increased tractive effort results from a circumferential shearing deformation of the carcass (which is negligible under high inflation pressure), causing an appreciable increase of creep. Hence, the correction for creep and slip includes a part of the carcass loss.

Fig. 2 shows the effect of speed on power loss at four different air pressures when a tire is run under constant axle load. The loss is nearly proportional to the speed, the rate of increase being greater as the air pressure decreases.

Fig. 3 shows the effect of axle load on power loss under four different air pressures when a tire is run at a constant speed. In this case also the loss is about proportional to the load, the rate of increase being greater as the air pressure decreases.

Fig. 4 shows the effect of inflation pressure on power loss under three different axle loads when a tire is run

at constant speed. In these cases there is a rapid increase in power loss under low air pressures. Under high air pressures the loss approaches a constant value.

Fig. 5 shows the influence of temperature on power loss. Tires were started at room temperature in each case, in which condition the losses are comparatively high. The pressure was kept constant, and at the end of about 30 minutes tires had become warm and losses had decreased to a normal figure and remained constant.

Fig. 6 shows one of the results of the power loss, an increase in temperature and pressure in the tire. The curves showing temperature rise are based on the assumption that the volume of air in the tire remains constant, and that the capacity of the connecting tubes and the gage are negligible. The initial temperature and pressure having been measured, the temperature at any time during the run is computed from the equation:

$$t = T \frac{P_2}{P_1} - 460 \dots \dots \dots (5)$$

where t = temperature in tire in deg. Fahr.,

T = absolute temperature in tire at beginning of run,

P_1 = absolute pressure in tire at beginning of run,

P_2 = absolute pressure in tire corresponding to the temperature t .

Fig. 7 is similar to Fig. 4, except that it shows a comparison of eight tires of different makes. The greater power loss in fabric tires shows up very plainly.

The question may arise as to the practical value of determining power losses in tires. These losses represent the energy absorbed by the tire and dissipated as heat while transmitting power from the axle to the road. They are due principally to internal strains in the tire, largely in the carcass. A large power loss results in (1) a correspondingly high fuel consumption, (2) quicker deterioration of the rubber and fabric on account of increased strains and increased temperature.

As examples of the association of power loss with the life of tires, the loss in a 4 in. fabric tire is in the neighborhood of 40 per cent higher than in a cord tire, even

where both are the same size. Based on the ordinary mileage guarantees, the life of a fabric tire is about 40 per cent less than that of a cord tire. A 35 x 5 cord tire was found in which the power loss was abnormally high. A subsequent examination of the tire showed that although it was constructed in the usual way and with proper materials, the coats of rubber between the plies were very thin, a feature which would have resulted in a short life. Hence, the fact that the tire was not up to the proper standard was determined in the laboratory within a very short time without injury to the tire.

One point which should be recognized is that the power loss alone does not show the value of a tire from the standpoint of service, but, other things being equal, it should aid in determining the quality. For instance, the tire could be built with a reduced number of plies, which, with proper proportioning of rubber, might give a lower power loss. However, in service the tire would probably not be sufficiently rugged to withstand the ordinary blows to which a tire is subjected. A tire could be built of a very hard material, such as steel, which would result in a very small loss. The cushioning properties, however, would be entirely lacking. But, if we take two tires of the same general design, the one having the materials and construction so co-ordinated as to give a lowest power loss should have a longer life.

Aside from the question of design of tires, the power losses under different loads and air pressures indicate the proper conditions under which a tire should be run. In case of changes in these conditions the effect on the life of the tire is at least indicated by the corresponding change in power loss.

These preliminary results on power losses in tires show that, in general, the loss increases directly with an increase in speed or axle load and that it increases quite rapidly with decrease in air pressure below the standard. Tractive effort has a comparatively small effect on the power loss. There is a wide variation in the power loss in different tires run under the same conditions. Some makes of tires show a larger power loss than others, and fabric tires as a class show a considerably greater loss than cord tires.

New Highway Tests Devised at Bureau of Roads

SOMETHING new in tests for highway materials has been undertaken by the Bureau of Public Roads with a new mechanical device. The series of tests consists of 120 concrete slabs ranging from 4 to 10 inches in thickness and from lean to rich mixtures.

In line with the bureau's policy of cheapening the cost of road construction by the use of local material wherever possible a circular track for a wear test on concrete has been completed. Sixty-one sections of concrete have been placed. The aggregates used vary in kind and quality, ranging from hard to soft, and there is variation in the amount of mixing water and time of mixing. In order to eliminate the effect of differences in the subgrade the sections are of reinforced T-beam construction, the slab being 4 feet wide, 10 inches deep with the T-beam in the middle of the slab. The traffic test on these sections will begin soon and the load on the pavement will be made to represent the rubber-tired rear wheel of a 3½ or 5-ton truck moving at a speed of 15 to 20 miles per hour. Specimens of concrete for beam strength and compression tests have been made from each mix and are being cured under the same conditions as the corresponding sections.

Results of this wear test, representing modern traffic

conditions, together with the beam strength and compression tests which will be made for this investigation and on a similar set made in connection with the impact investigation and which will serve to tie the two together, will furnish a sound basis for the consideration of suggested changes in specifications for concrete road aggregates.

Airplane Factories Being Built in Japan

THE demand for airplanes for commercial and other purposes is becoming so large that several airplane factories are now being built in Japan, according to the July issue of *Far Eastern Motors*. One factory in the neighborhood of Nagoya will be completed at the end of this year and will have a capacity of 50 planes a month. Another nearing completion in Gifu prefecture will employ 500 workmen. The national research laboratory at Osaka has discovered an incombustible paint, the main feature of the invention being a fiber treated by acetic acid dissolved in acetone. When this mixture is spread on the plane the acetone evaporates and the fiber is left as a film covering the body. This film is incombustible.

What Are the Essentials of a Good Ignition System?

Reliability, longevity and effect on engine performance are important, but engine manufacturer should consider ability of system to fire plugs under adverse conditions and the igniting quality of the spark. Engine builders should take greater interest.

By C. H. Kindl*

THE object of this sketch is to touch briefly on some of the problems connected with high tension ignition which are of interest to automotive engine manufacturers.

During the past five or six years the gas engine has progressed through considerable development, and exceptional improvements have been made as a result of refinement in design. The decrease in volatile properties of the present day fuels has led to a wealth of ingenuity being spent on carburetor designs. Numerous investigations are being conducted in an endeavor to determine what constitutes the process of combustion.

However, comparatively little research work has been attempted on the subject of electric spark ignition, although the utilization of high tension ignition has been largely responsible for the remarkable development of the automobile. Perhaps the lack of scientific investigation on the important subject of ignition is due to the apparent satisfaction the engine builders have obtained with the

effect on engine performance, and the igniting quality of the spark.

The reliability and length of life are at present usually considered when various ignition systems are compared. In order that the remaining qualities of ignition may be logically understood, it is necessary to discuss the character of the spark.

The voltage obtained at the spark plugs is generated by the collapse of the magnetic lines of force set up through an iron core by current from the battery flowing through wire wound around the iron core. When the breaker contacts open, the lines of force collapse in accordance with the constants of the circuit, and by cutting the turns of the secondary winding, generate the voltage necessary to produce a spark at the plugs.

AS the voltage rises a slight current flows and charges the high tension leads until a value is reached which breaks across the spark plug gap and releases the energy stored in the high tension leads, at the same time draining the energy from the coil as the magnetic field collapses still further or oscillates. There are thus two distinct portions of the process; namely, the capacity (leads, etc.) and the inductive (magnetic) discharge. The first part has been known to take place in less than one thirty-thousandth of a second after the breaker points separate. This first part usually requires the smaller part of the total energy delivered by the coil, but its value is very nearly constant at various speeds. The inductive discharge that follows varies with the amount of energy available in the coil and becomes small at high speeds in a battery system, while with a magneto this portion becomes larger at the high speeds.

The following hydraulic analogy may give a clearer physical conception of the phenomena involved. Fig. 1 illustrates a diagrammatic secondary circuit of the usual high tension ignition system. Fig. 2 shows a comparative water circuit, in which a hydraulic pump represents the ignition coil and *D* is a diaphragm to prevent the flow of water into the lower chamber. The small diameter section of pipe at the pump limits the flow of water in a manner similar to the resistance of the winding in the spark coil. The large section of pipe leading to the diaphragm corresponds to the comparatively low resistance leads and cables used in the electrical case. Suppose the pump is operated by a limited source of power in a similar manner in which the electrical value is limited by the character of the coil. Assume the pump to operate and gradually fill the pipe *P*.

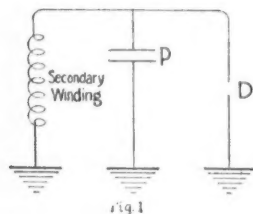


Fig. 1

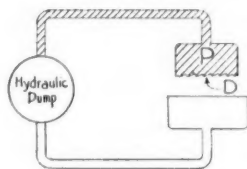


Fig. 2

Fig. 1—Diagrammatic secondary circuit of a high tension ignition system. Fig. 2—An hydraulic circuit that is analogous to the electrical one in Fig. 1

products of ignition manufacturers. In addition, the refinements in design have kept pace with other engine equipments to the extent that the number of engine failures which are attributed to improper ignition are to-day about 30 per cent, while a few years ago the unreliability of electric ignition was responsible for at least 80 per cent of engine failures on the road.

With the progress along parallel lines has come the necessity for automobile manufacturers to investigate more carefully the ignition apparatus used on their product. The important items, aside from cost, may be stated as follows: Reliability, length of life without replacement, ability to fire the spark plugs under adverse conditions, the

*Automotive Engineering Dept., Westinghouse Electric & Manufacturing Co.

The diaphragm *D* prevents further movement of water and the pressure on the diaphragm begins to rise until a value is reached at which the diaphragm breaks and the water rapidly discharges into the lower portion. This first discharge results from the water stored in the pipe *P* at a high pressure, and when this amount is exhausted the pump continues to supply water, flowing out of the pipe at a much smaller rate, until the source of energy at the pump is exhausted.

Fig. 3 gives an oscillograph record of the current flowing across the plug points. The current from *a* to *b* represents the capacity component. This value changes only slightly

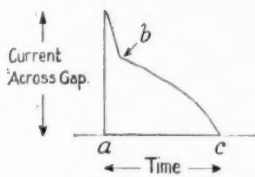


Fig. 3

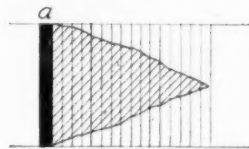


Fig. 4

Fig. 3—Oscillograph of current across plug points. Fig. 4—What the spark looks like in a rotating mirror. The portion *a* corresponds to the capacity discharge

with speed, while the portion from *b* to *c* becomes smaller as the total energy in the coil is decreased.

The capacitance component of the energy may be represented by $\frac{1}{2} CV^2$, where *C* = electrostatic capacity of the secondary windings, leads, and spark plug, and *V* = the sparking voltage, while the total energy in the coil = $\frac{1}{2} Li^2$, where *L* = inductance of the primary windings and *i* is the primary current at the time the contacts open. The electrostatic portion of the spark is distinct and has different properties than the remaining inductive discharge. If the spark is examined in a rotating mirror, or is observed in a rotating gap such as used for determining automatic spark advance, a bright spark is observed at the start, followed by a flame colored discharge. The first luminous spark represents the electrostatic portion, and the flame component is due to the remaining inductive discharge. Fig. 4 represents the appearance of the spark when observed in a rotating mirror. The portion *a* corresponds to the capacity discharge and is a white bright color. The remaining series of lines show the inductive discharge, and from the appearance of the distinct and individual lines, many investigators have concluded that there is actually a series of separate sparks resulting from an oscillatory discharge. However, rigid tests demonstrate that the current across the plug points is continuous until the spark is extinguished. When the drawn out spark is investigated with a spectroscope, the bright portion is shown to be of the surrounding gases, while the flame part contains vapors of the spark gap electrodes.

Combustion Not Due to Spark "Fatness"

It has been concluded from the results of numerous tests and investigations that the ignition of the mixture is accomplished by the electrostatic part of the spark, and if this portion is unsuccessful in producing ignition, the following inductive spark will usually have no effect. It is possible to obtain a spark in which the capacity component is small and produce ignition by the heat of the following discharge. However, this condition rarely occurs in practice, and it has been found that under such circumstances the ignition does not operate regularly. This means that the total energy or "fatness" of a spark has little value as a means for determining the igniting properties. In spite of substantial evidence which proves that the combustion

of the mixture is not due to the "fatness" of the spark, there are very few who have given up the practical man's love for a "fat spark with whiskers."

The foregoing is not meant to convey the impression that the energy component of the spark is of no importance. It will be shown later why the high energy is of considerable value for insuring the passage of a spark at the plug, but the igniting value of the spark is not in general increased by the flame portion of the discharge. That the capacity component or initial discharge has a greater igniting value may be demonstrated by inserting resistance into the primary circuit of a magneto or battery coil until the engine fires irregularly. If a condenser of correct capacity is then connected across the high tension circuit, firing will again become regular. The actual energy delivered to the plug gap is slightly smaller when the condenser is used, although the nature of the spark is changed to become more suitable for ignition.

Paterson and Campbell* have used rather elaborate experimental apparatus whereby the energy of the spark could be accurately controlled and they have experimentally obtained curves, Fig. 8, whereby it is shown that the minimum energy required to ignite various mixtures depends to a great extent upon the voltage required to jump the plug gaps. Other investigators have found a similar result and in addition have discovered that the capacity across the plug cap also affects the igniting value of the spark, although not to as great a degree as the voltage.

Electrostatic Component of the Spark

One naturally believes that it seems logical to increase the electrostatic component of the spark. Since this energy is represented by $\frac{1}{2} CV^2$, the value can be increased by enlarging either the capacity or the sparking voltage. The sparking voltage depends upon the distance between the plug electrodes, and as the voltage enters into the energy as the square, considerable increase in igniting power is obtained by enlarging the gap. Anyone who has had experience with high tension ignition knows that imperfect firing may result from too small a gap, although in this case the flame portion of the spark is greatly increased. Of course, the gap cannot be increased indefinitely or a sparking voltage may be reached, which is not obtainable with the conventional coil and no spark will pass between the plug points. There are also limits on the electrostatic capacity that may be used in the high tension circuit, since the energy for charging this circuit must be obtained from

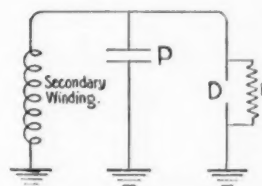


Fig. 5

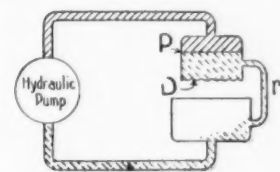


Fig. 6

Fig. 5—Diagrammatic secondary circuit with a leaky plug. Fig. 6—Hydraulic circuit that is analogous to electrical circuit in Fig. 5

the coil. That is, the electrostatic energy = $\frac{1}{2} CV^2$ or $V^2 = \frac{2E}{C}$, and if *E* is the energy in the coil, a value of *C* may

be obtained whereby the voltage is smaller than that required to jump the plug gap. In this respect the energy and the voltage supplied by the coil are important.

The energy available in the coil is also extremely important when considering the operation of an ignition system with fouled spark plugs. The ohmic resistance of spark plugs decreases rapidly as the temperature increases, and deposits of carbon products on the insulating portion of

*"The Philosophical," vol. xxxl.

the plug may result in the elimination of the spark between the electrodes. A conception of what takes place may be obtained from a study of an hydraulic analogy. Figs. 5 and 6 are comparative from the electrical and hydraulic standpoint. In Fig. 5 the resistance r corresponds to the leaky portion of the plug caused by a sooty deposit or a leaky insulator. In Fig. 6 a pipe of small cross section r leading from the main pipe allows a small amount of water to leak away. As in the former analogy, the pump generates an increasing pressure in the pipe, but if the leak r is sufficiently great, the water will drain away, with

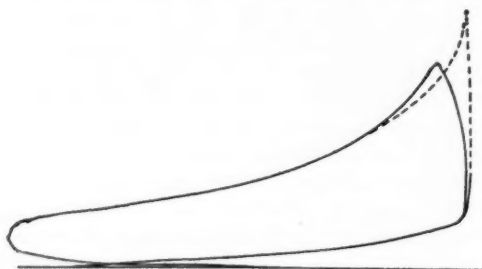


Fig. 7—Indicator diagrams for single cylinder engine. The difference in the two cards was effected by changing the character of the spark

the result that the pressure may not become large enough to break the diaphragm. In the electrical case, the voltage builds up but current is constantly passing across the resistance r and may drain the source of energy to the extent that the voltage may not become great enough to produce a spark across the plug points. However, if the pump in the hydraulic case or the coil in the electrical case supplies energy rapidly enough, the leak may not be sufficient to prevent breaking of the diaphragm, or, in the latter case, prevent a spark. Such conditions are normal in engine operation, and it is for this reason that ignition systems are designed to produce many times more energy than is necessary for ignition under ideal conditions. However, it should be remembered that great energy is desirable for insuring a spark under adverse conditions, but the actual energy in the spark is not a direct measure of its ignitive power.

It was previously stated that the sparking voltage depends upon the distance between the spark plug electrodes. However, with a fixed distance between points, the shape of the gap and the characteristics of the coil voltage also determine the sparking voltage. Most spark plugs have the electrodes of two wires arranged so that spark jumps from the end of one to the side of the other, with the result that there is little variation in the sparking voltage between different makes of plugs.

Voltage Wave Front

On the other hand, the rapidity with which the voltage rises in the secondary windings, influences the sparking voltage considerably. This quality is commonly spoken of as the steepness of the voltage wave front. Thus various ignition systems will require totally different sparking voltages on the same plug, and, in general, the steeper the voltage wave front, the greater is the sparking voltage. This feature is extremely difficult to measure and can be neglected without much loss as to the value of an ignition system.

Numerous investigations have been made in an endeavor to determine whether the type of spark has any effect on engine performance. Several investigators have concluded

that if the spark is of sufficient value to produce ignition, no change in operation can be obtained by varying the type of spark. However, there is sound evidence that the character of the spark influences the rate of combustion to some extent.

An experiment described by Burgess and Wheeler* consisted in igniting in a glass enclosure a mixture of ethane and air. When ignition was obtained by means of the ordinary induction coil, the gas burned rapidly, although the flame propagation could be followed by the eye. When a Wehnelt spark was used for ignition the mixture exploded violently, shattering the enclosure. Although the two types of sparks used differed widely in their characteristics, there is no doubt that at least in this case the nature of the spark affects the rate of combustion and the pressures obtained. The above phenomenon is probably due to the pressure wave caused by a spark discharge in a gas. Such an action may be observed by applying the conventional ignition spark to the closed end of a glass U tube partly filled with water, the other end of the U tube being open. At each passage of the spark there is a quick movement of the liquid as though it had been struck by a blow. J. J. Thomson** mentions the high local pressures that can be obtained by electric sparks. Referring to the work of Haschek and Mache, it is stated that these investigators have calculated from experiments that a spark 3 mm. long in air produced a pressure of 51.7 atmospheres.

Fig. 7 shows an indicator card taken on a single cylinder engine. The dotted and the solid lines illustrate the effects of two different sparks. In this case there was no change in the power developed by the engine, but smoother operation was obtained with the spark giving the dotted line. The apparatus was arranged for obtaining the two effects by the movement of a switch, so that the engine was not stopped and no change in the timing or the mixture was produced.

HOWEVER, several investigators have been unable to find any effect of the nature of the spark on the combustion of the mixture, but the possibilities involved are great enough to demand serious study.

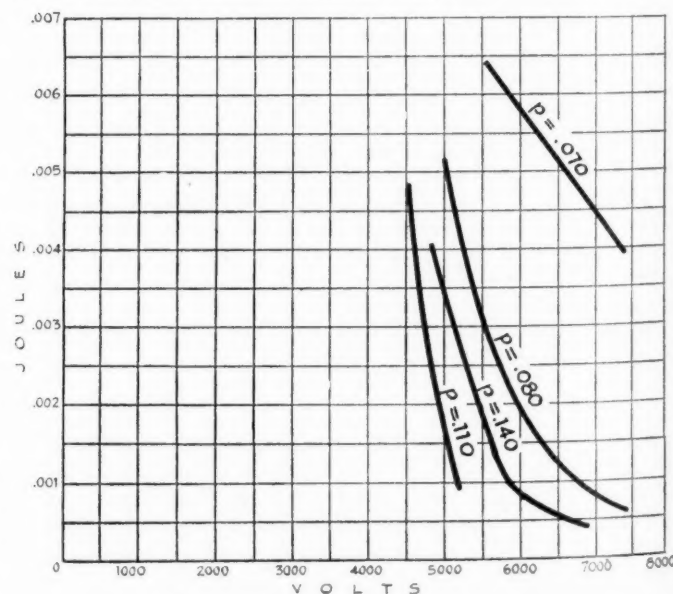


Fig. 8—Curves showing the relation between energy and voltages for different mixtures of petrol and air. P equals the mixture ratio by weight

From the designer's standpoint, many difficulties are involved in attempting to produce the ideal ignition system. To utilize the desirable features of an ignition spark without sacrificing the life and reliability of the

*The Lower Limit of Inflammation of Mixtures of Paraffin Hydrocarbons with Air—Trans. Chem. Soc. 1911.

**Conduction of Electricity Through Gases.

contacts is the designer's problem, which is usually solved by compromising. It is the engine builder's problem to determine what make of ignition has the best combination of the necessary features. The essential features may be summarized as follows: Reliability, length of life without replacement, the effect on engine performance, ability to fire the spark plugs under adverse conditions, and the igniting quality of the spark.

The first three of the foregoing divisions are at the present time considered by most automobile manufacturers. The ability to fire plugs under adverse conditions is rarely taken into account, but is highly important. For this purpose a convenient test for determining the relative performances of ignition units is to connect the high tension lead of the coil to a 3/16-in. spark gap in air and connect a high resistance circuit in parallel with the gap. This resistance may be of the water type and is decreased in value until missing occurs at the gap. The test should be repeated with various ignition units and the one which can operate with the lowest value of resistance will pre-

dominate in actual operation on an engine. An energy test of the spark will also have some bearing on the above point.

The igniting value of a spark is difficult to determine, especially in view of the diversity of opinion regarding points of merit. Any testing for this quality involves the use of elaborate instruments which are beyond the scope of the engine builder. However, the maximum sparking distance in air is of importance in the igniting quality of a spark, but with tests of this nature the three-point spark gap or the spherical gap must be used to obtain consistent results.

The engine builder cannot know too much regarding the subject of ignition, but the problems are so specialized that the average person is content with a general knowledge of the fundamentals. It is the duty of engine builders to show more interest in the qualities of an ignition system, and their endeavors would produce a greater activity from ignition manufacturers in an attempt to obtain the ideal ignition.

Formulate Standard Method for Rating Tractors

O. W. SJOGREN, a Subdivision of one appointed to formulate a report on Tractor Ratings, has transmitted the following report of the Subcommittee on Tractor Ratings of the American Society of Agricultural Engineers, for the consideration of the Agricultural Power Equipment Division:

The object of this report is to recommend a standard method or code for rating tractors, by which either new or old models can be accurately rated. The rating is to cover (a) brake horsepower delivered to the pulley on the machine driven and (b) horsepower delivered to the drawbar at plowing speeds.

Brake-Horsepower Rating

The following tests shall be conducted on each tractor selected by the board of engineers in charge of the tests:

1—"Limbering-Up" Test

The object of this test is to eliminate the stiffness likely to be found in a new machine. In this run tractors will be used to pull harrows, packers, or anything that will furnish a suitable drawbar-load.

The loads to be pulled will be (a) approximately one-third load for 4 hr., (b) approximately two-thirds load for 4 hr., and (c) approximately full load for 4 hr.

If the tractor manufacturer believes that a 12-hr. run is not sufficient to limber-up the tractor, reasonable additional time will be allowed.

2—Brake-Horsepower Test at Maximum Load

The object of this test is to determine the greatest load the tractor engine will carry on the belt with the governor set for rated speed and the carbureter set for maximum power. The brake-load will be increased until the horsepower developed is the greatest.

The rated speed is to be considered the speed of the engine under load.

This test should begin after the temperature of the cooling fluid has become constant.

The duration of the test shall be 1 hr. without interruption or change in load or tractor adjustment.

If the speed should change during the test enough to indicate that conditions had not become constant when the test was started, the test will be repeated with the necessary change in load.

3—Brake-Horsepower Test at 80 per cent of the Maximum Load Recorded in Test 2

The object of this test is to show whether the engine will carry continuously its rated load on the belt and to show the fuel consumption at the rated load. The governor is to be set to run the engine at rated speed.

The test will commence after the temperature of the cooling fluid has become constant.

The duration of the test will be 2 hr. without interruption or change in load or engine adjustments.

After tests 2 and 3 shall have been conducted to the satisfaction of the board of engineers in charge of the tests, the nearest whole number to the load carried in test 3 is to be considered the brake-horsepower rating of the tractor.

4—Brake-Horsepower Test at Varying Load

The object of this test is to show fuel consumption and governor control when the load varies.

All adjustments are as in test 3.

The time and the load are as follows:

- 10 min. at rated load or load carried in test 3
- 10 min. at maximum load
- 10 min. at no load
- 10 min. at one-fourth rated load
- 10 min. at one-half rated load
- 10 min. at three-fourths rated load

The total running time is 1 hr. and the test is to be conducted without stopping the engine or changing its adjustments. If load changes make readjustments necessary, the final report of the test shall state the fact.

The variation in speed from the rated speed shall not be more than 10 per cent.

5—Nebraska Results May Be Accepted

In lieu of tests 1, 2, 3 and 4, the board of engineers may accept the results of similar tests on the same model of tractor conducted by and under the rules of the State of Nebraska for tractor tests. The brake-horsepower rating, however, is to be only 80 per cent of the maximum horsepower determined by Nebraska tractor tests.

Stopshok Wheel

IN our issue of Aug. 3, 1922, appeared a description of the Stopshok truck wheel which was incorrect in certain particulars. We therefore make the following correction:

The web of the wheel is not armored wood, but of hollow corrugated steel construction, forming a bridge-like structure which is said to carry the load throughout its circumference regardless of the point of application.

The wheel can deflect 1½ in. in any direction in a plane parallel to disks, or a distance of 3 in. between extremes.

Once adjusted the spring which holds the wheel in place requires no further adjustment with change in load on the wheel, but automatically cares for load variation.

Using a Single Locating Point in Differential Carrier Production

Method of location confined to pinion bearing bore. Massive structure of machines secures rigidity. Axles for high priced car produced by this method at rate of one every nine minutes.

By J. Edward Schipper

THE necessity for extremely accurate work on differential carriers was pointed out in *AUTOMOTIVE INDUSTRIES* of Aug. 31. In connection with this, a description was furnished of the layout in a modern plant in which all of the machines were tuned up to secure an ideal in accuracy which, not many years ago, would have been considered almost impossible in this unit. Up-to-date men in the automotive manufacturing field, however, now realize that almost without exception the need for accuracy in this unit is as great as in units which perform a more spectacular part in the performance of the automobile. When it is considered that accuracy in this part is responsible for proper location of the bearing and even of the proper engagement of the gear teeth, it may be clearly realized that without extreme care in the manufacture of the differential carrier, the efforts expended in securing accurate cutting of the gear teeth are wasted.

The plant described here is that of the Eaton Axle Co. of Cleveland. In following the detail description of the various operations through, the point which should be particularly borne in mind is how accuracy is secured through the use of only one main locating point for practically every operation. The production manager has realized that the only real way in which accuracy can be secured is to avoid jumping from one point of location to another. He has adhered to the plan of confining the method of location to the pinion bearing bore, which establishes a center and a proper relationship for all parts of the carrier.

Sixty Axles Per Day

All of the operations are tuned for a 60-per-day output of this particular piece. The Eaton axle plant manufactures several types of axles and the carrier described herewith is used in a high-priced high quality car. The axle output as described in the operations noted herewith are all based on a speed which will very closely approximate an average output of 60 for a 9-hour day, or, in other words, 1 axle every 9 min.

The first machine operation is handled on a Potter & Johnson, which chucks the malleable casting for the carrier against the wide flange, the location being from the outside diameter of this flange. The casting is drawn back against a plate for end location, the pinion carrier face is milled off and the small end of the malleable casting is bored for the pinion carrier bearing.

For the second operation, the casting is reversed and in another Potter & Johnson the large flange is faced off

as is also the surface for the bearing cap. The location for this operation is from the bore for the pinion carrier bearing, which was secured in the first operation. All the other operations, as will be seen, are located from this bore where it is at all possible to do so. The two first operations which are similar in character and handled by similar types of machines are run by one man. These operations are illustrated in Figs. 1 and 2. An interesting feature which is brought out by these illustrations is that, due to the large diameter for the pinion shaft bearing bore, a very substantial pilot can be used for location, which makes the possibility of misalignment very remote in these operations.

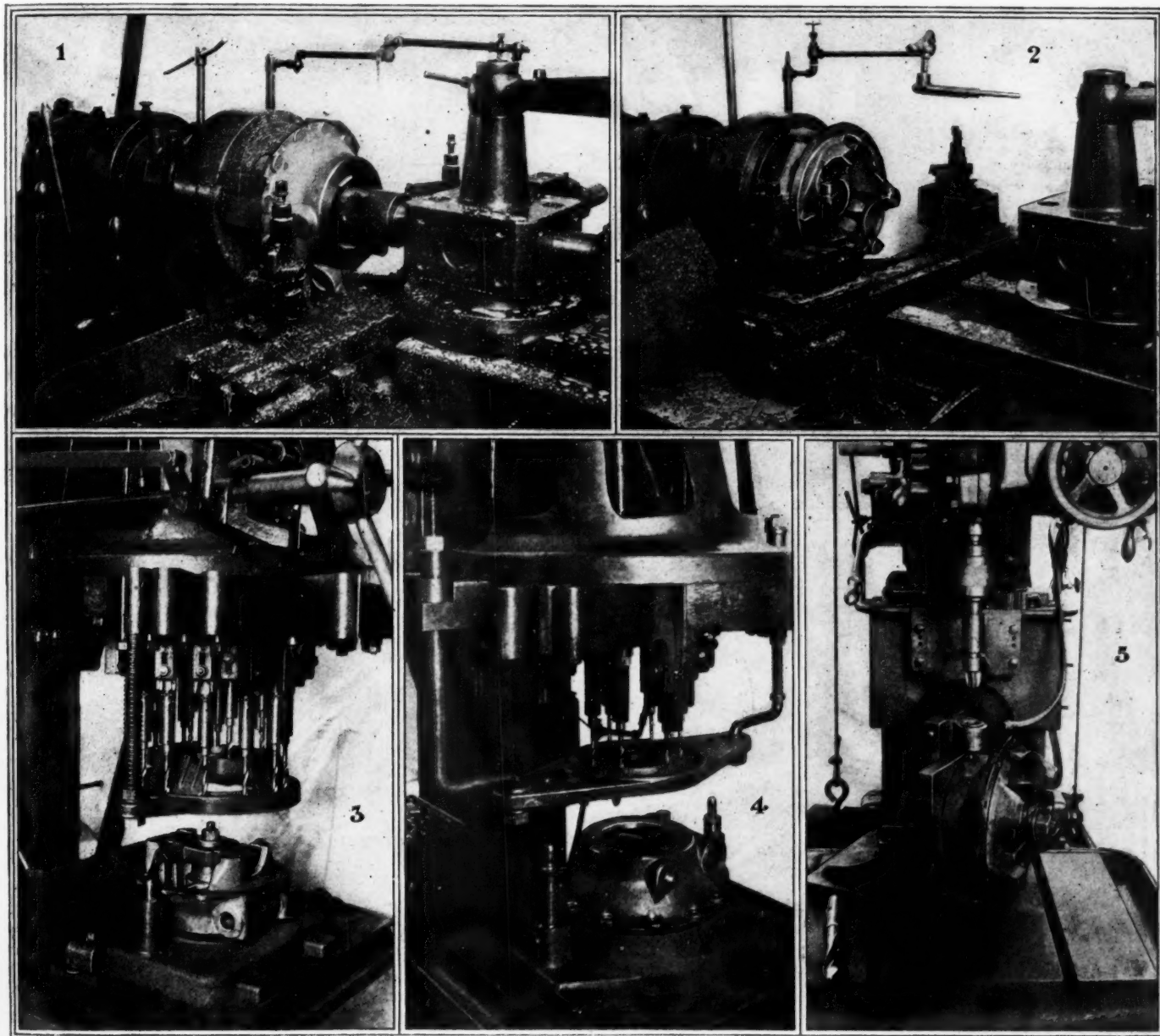
Drilling Operation

All of the holes in the large flange are drilled simultaneously on a Fox multiple spindle drill, as shown in Fig. 3. This machine not only takes care of these twelve holes, but also the four bearing cap holes simultaneously. The same location, namely, that of the pinion bearing bore, is utilized and in addition a V-block is clamped down into the cross-bore for the differential carrier. A feature which may also be noted in the illustration is that the part of the fixture which lowers with the drill is piloted on the lower portion which holds the work. This assures proper alignment and at the same time is noteworthy for its simplicity.

Following a spot-facing operation on a single spindle Barnes machine, another Fox drill is employed as shown in Fig. 4, for the pinion carrier face. This machine has six spindles and the work is located from the pinion carrier bore and by dowels through two holes in the large flange.

A Minster drill is employed for the hole in the upper part of the housing. The same machine is used for drilling and tapping, the shift from the drill to the tap being made by means of the Magic chuck. This is a 1 3/16-in. pipe thread to take a plug which closes this hole. Location is from the pinion bore as usual, there being a pilot on the fixture for this purpose and the clamp which holds the work against the face plate of the fixture rests in the cross-bore which locates the work circumferentially. This operation is shown in Fig. 5. For tapping the pinion carrier face holes, a Barnes machine is employed. This is a self-centering operation and requires no elaborate jig or fixture for the work.

The set-up for the next series of operations is very interesting from a production standpoint, as it allows



1—Facing pinion carrier face on Potter & Johnson machine. This is the first operation on the Eaton differential carrier, which is a malleable casting. 2—Facing the large flange and the surface for the bearing cap, the work being located from the pinion carrier bore. 3—Drilling the large flange and also the bearing cap boss holes on a Fox multiple spindle drill. 4—Drilling the holes in the pinion carrier face with a six-spindle Fox drill. 5—Drilling and tapping peep holes in the differential carrier on a Minster drill

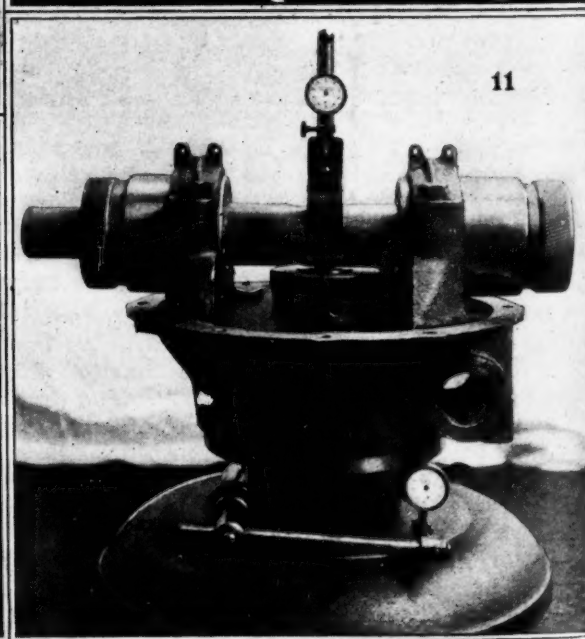
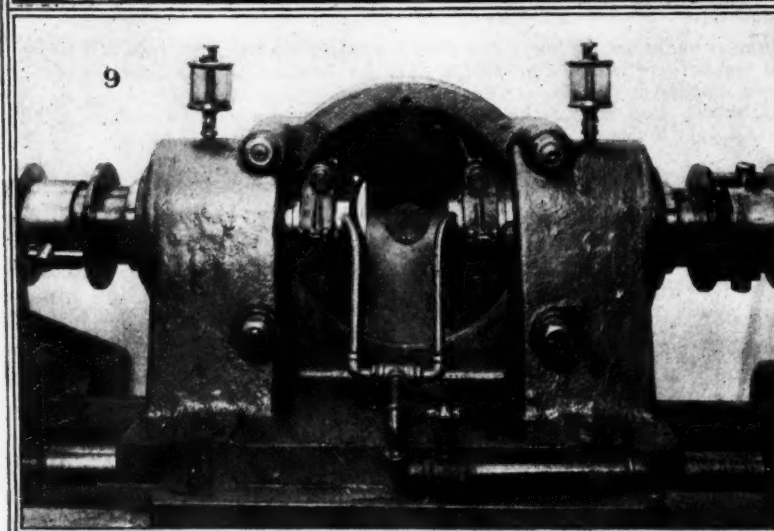
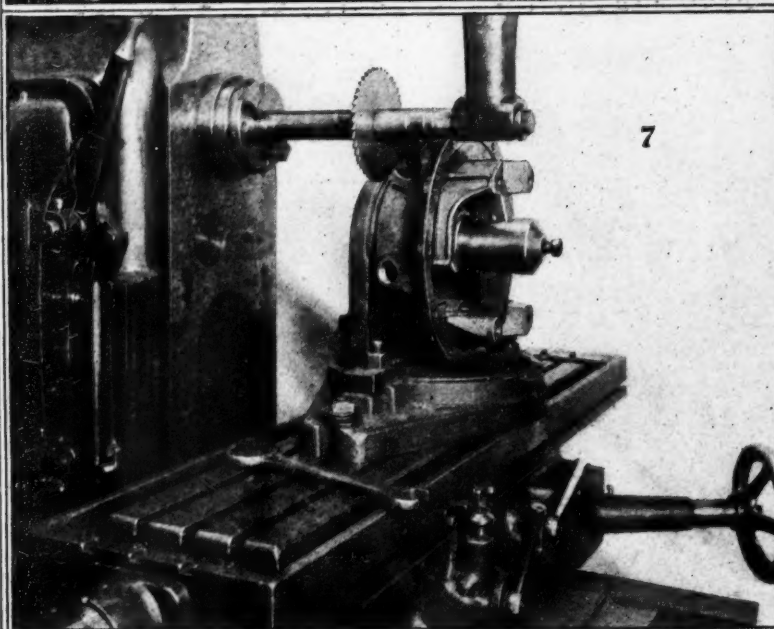
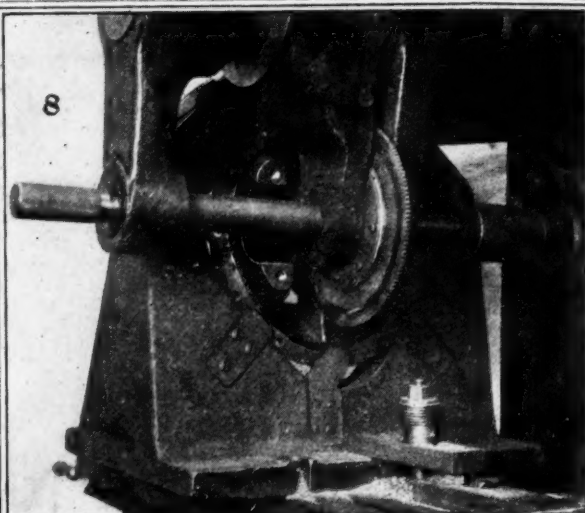
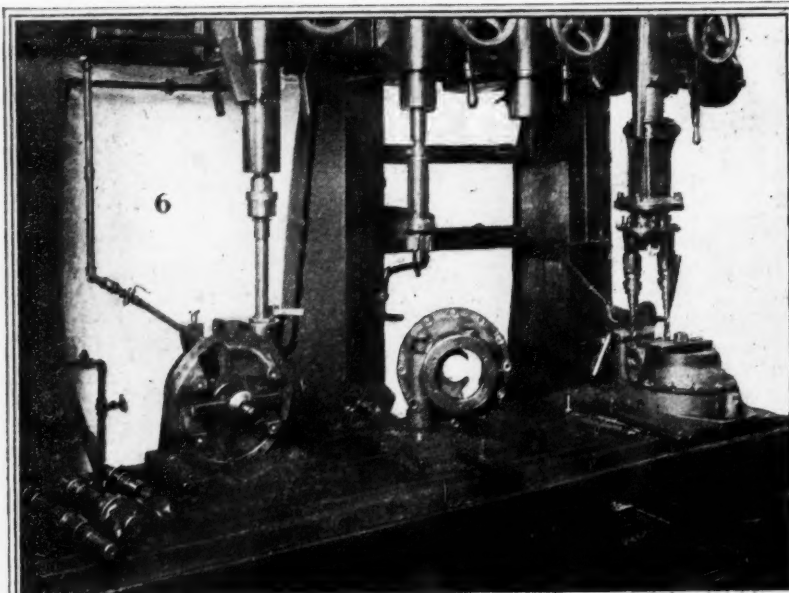
of a minimum number of operators and permits full advantage to be taken of the possibilities of the Magic chuck for quick tool changes. The machine used is a Foote-Burt No. 4½ four-spindle drill. The first operation shown at the right of the machine is the drilling of the clamp bolt hole for the torque arm pin. Location of this is from the pinion bearing bore and by dowel pins through two holes in the large flange. Other operations shown on this machine are the drilling, reaming and spot facing for the torque pin hole. This is a 1¾-in. diameter hole on which there is a plus and minus limit of .0005 in. Location for this work is also from the pinion bore with a pilot on the fixture.

The saw cut for the two clamp bolts through the torque pin boss is performed on a Cincinnati miller, as shown in Fig. 7. In this instance the location is from the pinion carrier face. The carrier is also piloted through the bore as illustrated. The dowel pin hole for the torque pin thrust washer is drilled on a high speed drill, the

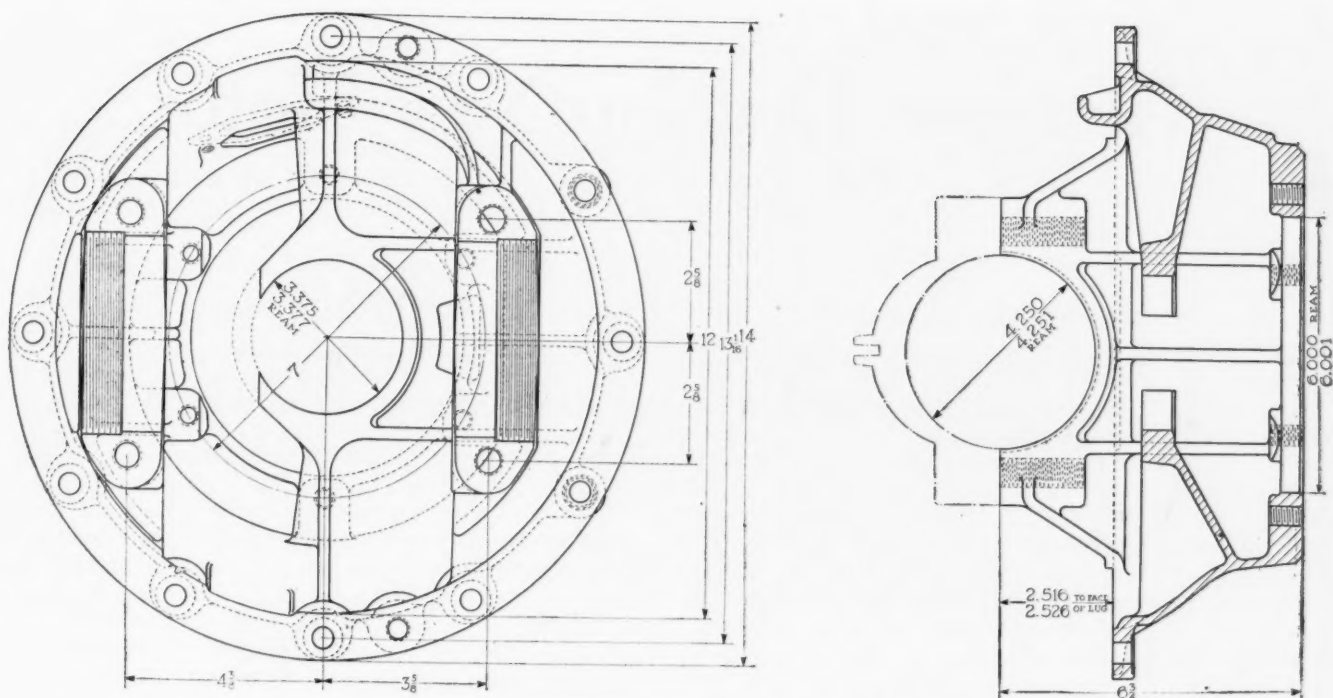
location for the drill hole being from the saw cut and the reamed bore.

Another saw cut made on the casting is for the clearance for the ring gear. This cut is through the pinion bearing the carrier. The work is performed on a Kemp-smith milling machine. In this instance the location is from the large flange and from two drilled holes in this flange over dowels in the fixture. This operation is shown in Fig. 8.

To secure accuracy, the four bearing cap holes are hand tapped after they are machine tapped. After these bearing cap bolt holes have been carefully checked over, the bearing caps are put on and bolted in place. These bearing caps have previously been milled on the contact face and drilled for the bolt holes. There has also been a spot facing operation for the bolt hole clearance. They have also been machined for the lock which holds the bolt in place. This consists of milling for the lock finger, drilling for the cotter pin and rivet to hold the



6—Foote-Burt No. 4½ four spindle drill which drills the clamp bolt holes for the torque arm pin, taps them and also drills, reams and spot faces the torque pin hole. 7—Saw cut made for the two clamp bolts in the torque pin boss. This work is handled by a Cincinnati miller. 8—Making the saw cut clearance for the ring gear on the rear pinion bearing in the carrier. This is a Kempsmith milling machine. 9—Cross-boring the differential carrier on a National two-way lathe. The work is located from the small pinion bore and by the large flange through two dowels in the drilled holes. 10—Checking the alignment of the cross bore. 11—Gage used for checking alignment, squareness and off-center for the differential carrier



Views of differential carrier used in Eaton axle

lock finger. The caps are put on with .002-in. paper shims between the cap and the carrier. The cap screws are tightened with an air tightening arrangement consisting of an air drill fitted with a slipping clutch so as to secure uniform tightness on all of the cap screws.

The cross boring operation for the differential carrier is performed on a National two-way lathe. The operation is located from the small pinion bearing bore as in the previous operation and also from the large flange in the casting over the two dowels in drilled holes. The machine bores, reams and taps both sides at once. In mounting the differential casting for this operation, which is done with a high degree of accuracy, care is used to burr all the pieces where necessary so as not to spoil the alignment and to prevent any possibility of cocking of the work on the fixture. As an extra safeguard for accuracy, the cross-bore is hand reamed. This hand reamer is a special reamer so arranged that the reamer pilots on one side while reaming through the other. The limits on this reamed hole are plus and minus .0005 in. The work is first done on one side and then reversed and performed on the other in the same manner.

Following this hand reaming, the piece receives a 100 per cent inspection. Figs. 10 and 11 indicate some of the special respective jigs and gages used for this work. The limits against off-center are plus or minus .001 in. For squareness of the pin bore with the differential bore, which, along with other tests, is gaged, as shown in Fig. 11, is plus or minus .001 in. As will be noted, amplifying gages are used for checking squareness and misalignments. In spite of the fact that these are rigid inspections on work as large as this, the rejections after completion have been reduced to a point where they are negligible.

A FEATURE to be noted in scanning the operations described and illustrated herewith is the rigidity of the machines secured by massiveness of construction as well as by proper piloting arrangements. The machines are also noteworthy because of the fact that they are adapted to handling other than the work described herewith. The Eaton Axle Co. manufactures several different types of

axles and the tool equipment herewith is capable of handling axle designs which differ widely at material points. The machines are all stock and only in a very few instances has it been necessary to re-design or re-build any of them. The jigs and fixtures are also noteworthy for their simplicity. The shape of the casting is such that it is fairly simple to use the center bore as a location in an axial direction while the drilled holes in the large flange provide an opportunity of locating the work circumferentially.

THE cross-bore, which must be positively at right angles to the bore for the pinion shaft, also affords an opportunity for radial location which is taken advantage of in operations where the large flange could not be conveniently employed. Parallelism between the two faces of the casting is secured by first turning one face, that being at the smaller opening adjacent to the pinion bearing, then locating the center bore from this face and the large flange from the center bore. Both faces being square with the center bore are consequently square with each other. For that reason it is perfectly logical to use both the center bore and any point on the large flange for location. This method is followed successfully.

Elwell-Parker industrial crane capable of lifting 3000 lbs. at a 6 ft. and 1000 lbs. at a 12 ft. radius without outriggers. Stacks 12 ft. high with boom set to 3000 lbs. at 6 ft. radius. Load capacity, 1½ tons; total loaded weight, 8500-9000 lbs.



Germans Develop New Motor Plow Designs

Recent agricultural show has 17 motor plow exhibits. Large motor plows compete with steam plows. Korting Bros. make very small 12 hp. plow with two driving wheels. Unique features in anchor tractor produced by Arlt. Much attention given to design.

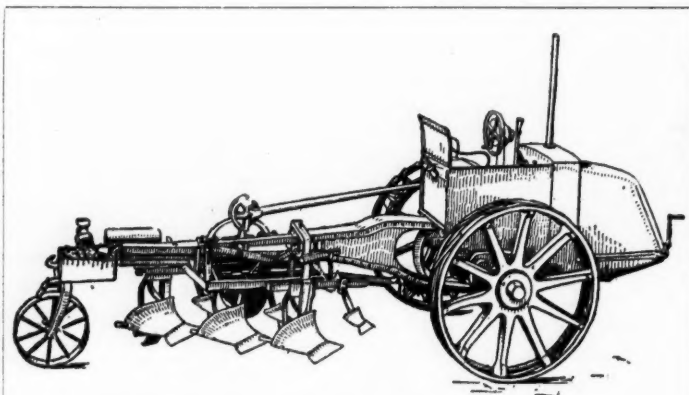
MOTOR plow design and construction has received considerable attention in Germany during recent years. Some novel designs have been brought out and in certain cases have been quite successful. At the first important exhibition held since the war by the German Agricultural Society, an unusually large amount of space was devoted to exhibits of agricultural machinery. An examination of the motor plows shown at this exhibition gives an excellent idea of the progress that has been made in these units by the Germans.

Dr. Gustav Fischer, writing in the *Zeitschrift des Vereines Deutscher Ingenieure*, says the many new designs exhibited indicate that the needs of mechanical tillage have not yet been satisfactorily met. He goes on to say that although many of the new machines are quite similar to older designs, some entirely new departures have been made. For a while it seemed as though the tractor would oust the motor plow completely, but at the show at Leipzig there were still seventeen motor plows as compared with twenty-four tractors, and in citing these figures it is only fair to state that of the tractors several were intended more for hauling trailers than for tilling operations. Cable plows too are still being manufactured, and among the latter the Ergomobilplow of Kuers, built by Borsig, has been in use the longest among German machines. It has a rating of 35-40 hp., and because no power is lost in moving the heavy machine over the field it has about the same working capacity as a tractor rated at 60 or 65 hp. The two-machine cable plow of the Pohl Works, with its 80-hp. engines, is practically on a par with the smallest steam cable plows of which J. Kemna of Breslau turns out one with a 50- to 70-hp. rating. A machine of far greater capacity is the cable plow of Benz & Cie., whose engine with its six cylinders delivers from 100 to 120 hp., and can be run on either gasoline, benzol or crude oil. As in most steam plows, the cable drum here is located under the engine frame on a vertical shaft. The engines run at 450 to 500 r.p.m., and their speed can be adjusted by means of the governor and temporarily also by hand, in order to

permit of starting and stopping the plow gradually. Dr. Fischer considers it questionable whether such a large motor cable plow can compete with a steam plow, for the less expensive delivery of the smaller quantities of fuel and water required and the ability to start instantly are balanced by the high price of hydro-carbon fuels, the low reserve power of the motors and especially the sensitiveness to faulty operation. Besides, the first cost of the motor plow is much higher than that of a steam plow of equal capacity.

In the small steam plow of Kemna the engine is located on top of the boiler and the transmission to one side, as

customary. The cable drum is located on the rear axle, which makes it possible to place the drive for this drum symmetrical with that of the rear axle. This cheapens the cost of construction for the reason that the wheels, shafts, bearings and connections for both drives are alike. The boiler is provided with a Schmidt smoke box super-heater. From the countershaft, located in front of the crankshaft, the cable drum and the rear axle are operated through roller chains,



Motor plow built by the Mann Truck Works

and the location of the countershaft in front of the crankshaft insures a sufficient distance between chain wheels. The speed of the engine can be raised to 400 r.p.m.; for operating a separator it is reduced to 220 r.p.m., at which speed the engine, it is said, still develops 25 hp.

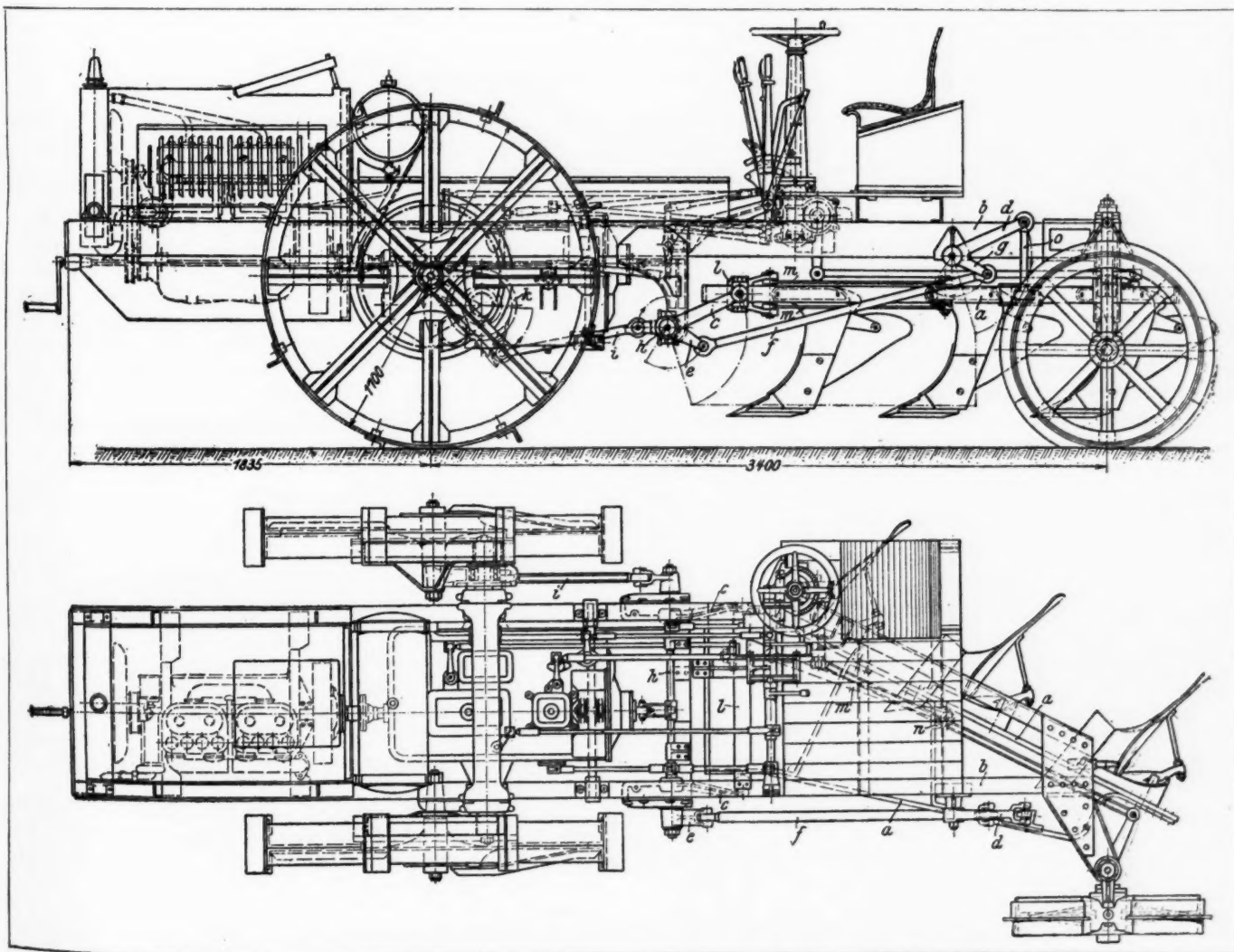
Motor plows can compete with tractors chiefly because as unit machines they are easy to handle and can be backed up without the driver going into contortions. The smaller motor plows therefore can be operated by one man. With the early machines, difficulties were experienced on account of the rigid construction, especially in hilly territory or in soil of varying hardness, in that the depth of plowing would not be constant. The Stock Motor Plow Company still continues the rigid connection of the plow with the frame in its new small motor plow, which permits great rigidity and a simple adjustment of the depth of plowing, but in this it now stands practically alone. Other manufacturers endeavor to free the plow frame from the motions of the wheel frame by providing the "through"

frame with a linkage or making it a wheel frame pure and simple, relative to which the plow frame is movable. In the majority of cases of larger motor plows modifications of the special plow frame introduced by Wendeler-Dohrn have been adopted. In the motor plows of the Lenaria Co. in Berlin, of E. C. Flader in Joehstadt and of Pfannhauser in Vienna the plow frames are movable in the horizontal direction also.

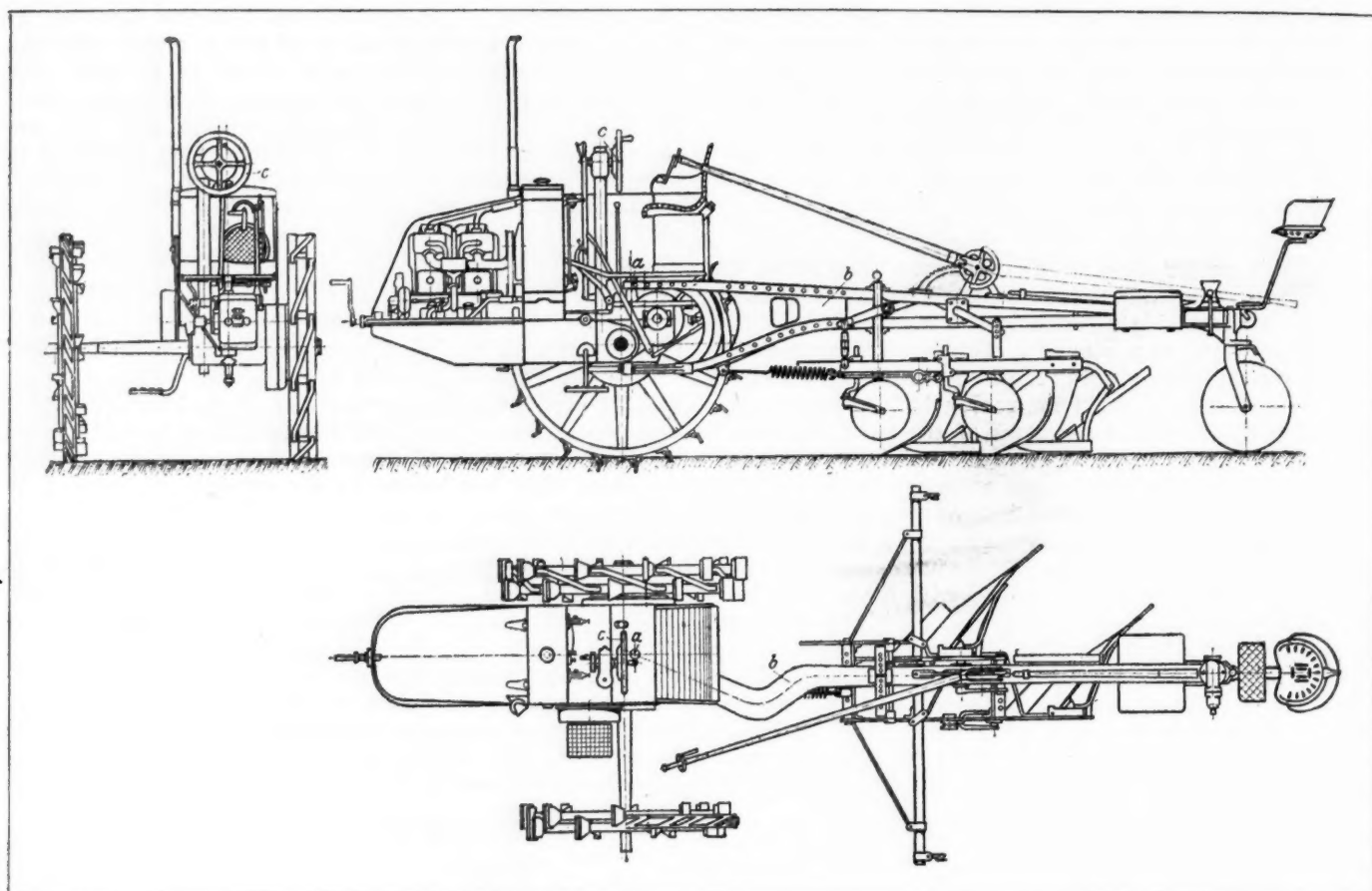
THE Alfa motor flow of Pfannhauser, illustrated on this page, carries three or six plow bottoms on a frame *a*, which is adjustable relative to the wheel frame *b* not only vertically but also laterally. The depth adjustment is made by means of a swinging lever *c* in front and a swinging lever *d* parallel to it in the rear, which are connected by a linkage *e, f, g*. The shaft *h* of the swinging levers is turned by means of rod *i* from the driving mechanism *k*, which at the same time causes a change in the settling of the right-hand wheel running in the furrow. The frame *a* is capable of moving sideways relative to the depth adjustment mechanism. The levers *c* do not carry the frame directly, but through a cross piece *l* with a shiftable lock which is connected through a pull rod *m* with the block *n*, adjustably mounted on the plow frame. The pull rod is adjusted in accordance with the width of plowing and the soil resistance. Minor changes in the resistance cause the plow to swing slightly, play for this swinging motion is provided by the suspension rod *o* between the rear part of the frame and the swinging lever *d*. The purpose of

this arrangement is to equalize the torsional moments to which the plow frame is subjected and to ensure that the moldboards either do not press at all or at most only lightly against the side of the furrow. This makes steering easier, which is otherwise rather tiring. For this reason it is also claimed to be unnecessary on level soil to provide the steering wheel with angle lugs. The machine is claimed to work with three bottoms 41.5 in. wide in deep plowing and with six bottoms 60 in. wide in turning under stubble. With a rating of 38 to 40 hp. the machine belongs to the larger class.

THE motor plow of P. Stumpf in Breslau, manufactured by the Prussian Mining Office Malapane, has a rating of 35-40 hp., and a plowing width of 40 in. The moldboards *a* are carried swingingly on parallel levers *bb* and can be adjusted by means of the air pressure cylinder *c*. In operation they are loaded by air pressure of about four atmospheres above the piston *d*, but by further compressing the air they can yield backward—each moldboard individually, as there is one air cylinder for each moldboard. The air cylinders therefore provide an elastic cushion, protecting the frame and the engine against overloading, and besides the plow can be lifted and let down by means of compressed air more quickly than by mechanical means. The plow bottoms also yield well before rocks. The compressed air installation is furnished by the Knorr Air Brake Works, who have had long experience in this line. Of course the installation works under less



Sectional views of the Pfannhauser motor plow



Sectional views of the Man motor plows

favorable conditions on the motor plow than in railroad work, on account of the constant pressure in the cylinder and the dirt, so that only extended experience can show conclusively whether it is practical, especially as regards the durability of the guiding and packing of the pistons. The depth of plowing is fixed in a very simple manner by the length of the chain between the frame and the mold board. When the plow is being lifted the top of the mold board abuts against the frame. In this position the edge of the plowshare is about 4 in. out of the soil. The machine is provided with a drive wheel of 75 in. diameter behind the engine at the right and a drive wheel 71 in. in diameter at the left, while at the rear end of the frame there is a steering wheel 32 in. in diameter. All wheels run on unplowed ground, and the moldboards are placed so far to the right of the axis of the machine that the resultant of the plowing resistances lies to the right of the center of the driving wheel.

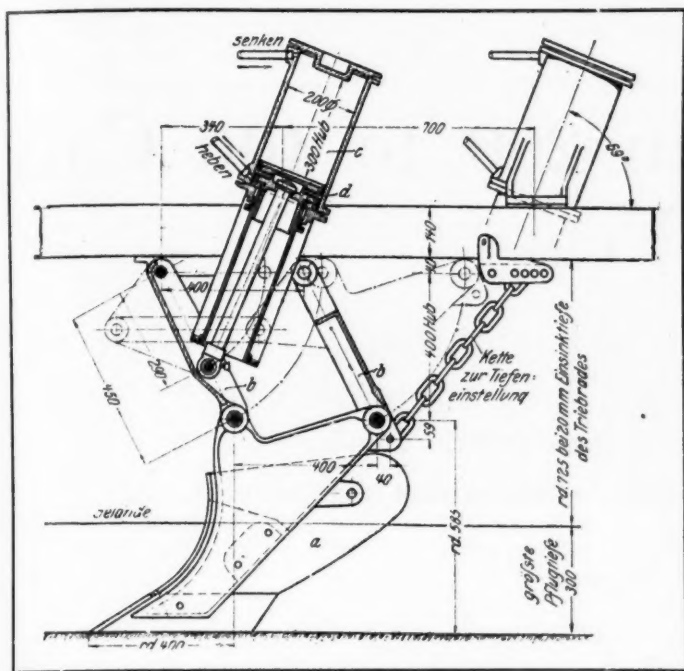
The Man Motor Plow

Under the patents of Dr. Bernstein the Man Truck Works have built a motor plow of 25 hp. rating, as illustrated herewith. In this machine the front part with the engine, the transmission and the drive wheels, and the rear part with the mold boards are completely separated. They are connected by means of a vertical pivot pin *a* which is displaced to the right from the longitudinal axis, toward the furrow wheel. In order to make it possible to turn in a short radius, the plow frame *b*, which consists merely of a steel beam set on edge, is offset laterally, and the operator may free the steering wheel so that it operates as a caster wheel. The differential gear has different reductions and transmits to the furrow wheel more power than to the land wheel, so that the latter may be moved far out from the furrow without creating any side draft. Drive wheel brakes are provided in order to facilitate

steering and the application of these is controlled by means of a differential gear from the steering wheel in such a manner that when the wheel is turned in one direction the brake on one driving wheel is automatically applied, and when turned in the other direction the other brake is applied. The frame of the front part is formed by the transmission housing which also carries the engine, and above and below the steering pins for the rear part. In this rigid frame housing all of the propelling elements from the engine to the drive wheels are safely encased. As yet this plow has not been thoroughly proven in practice, but it must be admitted, Professor Fischer says, that it embodies many ideas which seem to be thoroughly practical for small motor plows.

THE motor plow of E. C. Flader, which is built under the patents of Hans Kaufmann, is rated at 20-22 hp., and therefore has about the same capacity. It makes use of the same plan for steering as the Stock plow, with two driving wheels in front and one steering wheel in the rear. But since the plow frame may swing between the wheels around a pivot joint at its forward end, the rear wheel is almost completely relieved of lateral pressure and can be swung directly by means of a hand lever *a*. In order that this lever may be moved through a large arc without an excessive range of motion of the driver's hand, it is provided with a segmental handle so that the driver can change his hold.

The mold board, together with the pull rod extending from the front end of the wheel frame, constitutes a bell crank, which is under tension when the plow is lifted out of the ground and under pressure when the plow is lowered. For lifting the plow, use is made of the hand wheel *b* with a threaded shank and a nut *c* from which the rod *d* leads to the pivot of the bell crank. The depth of plowing is adjusted by varying the height of the plow



Depth adjustment on plow built by P. Stumpf

beam front end, the same as with a horse plow. When lifting the plow, the nut *c* travels upward and pulls a steel cable *e* leading over pulleys thereby also raising the rear end of the plow. This operation is facilitated by the counterweight *f* at the other end *g* of the cable. When the bell crank is close to the position of release, the component of the cable pull in the direction of the lifting rod *d* is quite large; therefore, the counterbalancing effect is great, whereas in the working position the weight of the plow is almost completely effective because the counterbalancing action is small. The cable allows the plow free play upward so that it may move out of the way of rocks. The bow *h*, which is provided with foot rests, guides the plow beam. This motor plow, also the forward part of the frame, constitutes the housing for the transmission and the drive wheel bearings, which carries the engine, but in this case the rear part of the frame, built up of rolled steel, is rigidly connected to the forward part. The engine is arranged transversely to the longitudinal axis of the machine, and in order to be able, in spite of this arrangement of the engine, to conveniently apply the starting crank, cranking of the engine is effected through the reversing gear. The inclined lugs on the driving wheels overhang the wheel rims and are stiffened at the outer ends by means of a ring which serves as a tire when the machine is being operated on public roads. The lugs on the land wheel consist of an angle iron. Those on the furrow wheel of flat iron, so that when the machine is driven on the road the two wheels are of approximately the same diameter. For different kinds of agricultural work plow beams with 1, 2, 3, or 5 mold boards are changed.

A very small motor plow is being manufactured by Korting Bros. Co. It is a two-bottom machine with two driving wheels and an engine rated at 12 hp. At its forward end the plow frame is pivoted to the wheel frame and its rear end is adjustable in a guide on the wheel frame. At the rear end the plow

frame rests on a small wheel, which runs in the last furrow. The operator can walk behind the plow, the same as with a horse plow, and guide by means of the plow handles, but there is also a seat provided for him at the rear.

Rather unique features are embodied in the anchor tractor manufactured by J. F. Arlt, Rubolstadt. At the rear there are two driving wheels and in front a single steering wheel, latter which naturally can be swung around its axis with less effort than a two-wheeled steering axle. In order that the front wheel may not get stalled dropping into a hole in the ground, nor get into the furrow as the result of faulty steering, steadying rollers of a slightly smaller diameter are located on both sides of it, upon which the tractor can rest. Below the tractor frame there lies a carrier with the draw bar hitch. Owing to the low position of this hitch there is said to be no danger of the tractor overturning, in spite of the small amount of weight on the front wheel. The lugs of the driving wheels are substantially radially adjustable and their spindles can be turned comparatively easily by means of a ratchet brace. Ordinarily all three wheels are to run on unplowed ground, but the right driving wheel may also run in the furrow if desired. In that case it is mounted in a slide and can be lowered eight inches. If the tractor runs with one wheel in the furrow the drawer pull is in line with the plow resistance and all side-draft is obviated.

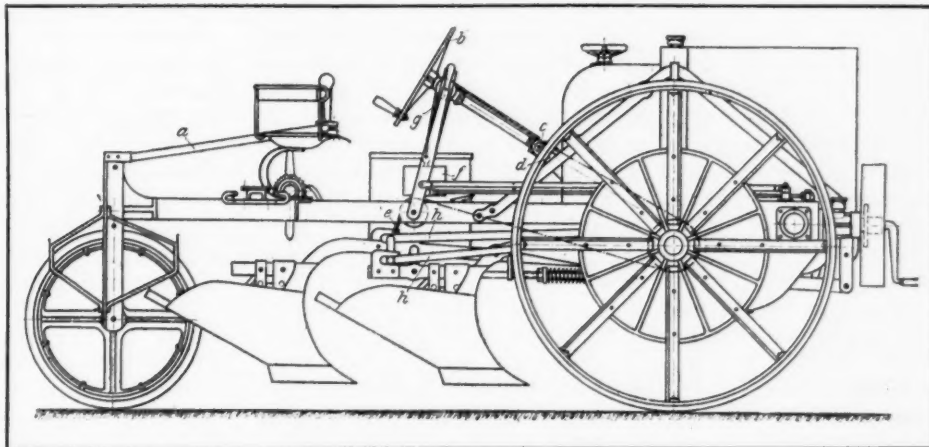
Cable Control from Tractor to Plow

The engine in the Arlt plow delivers from 35 to 38 hp. A steel cable control is provided between the tractor and the plow, which is claimed to enable the driver to control the tractor while seated on the plow. In order that it may be possible to steer the tractor without backlash when one of the cables is slack, as, for instance, in turning, the cables are surrounded by flexible but non-extensible wire sheathings. Only practice can show whether the arrangement is reliable.

LAST year's import of cars was only 287, compared with 816 in 1920. Imports of trucks fell from 109 to 29, and of chassis from 65 to 47. Of the cars imported last year, 30 came from Italy and ten from Germany.

The motor-car is fast becoming a business necessity all over the country. The conservative Ceylonese landowners of the interior also own numerous Fords and use them extensively. The import of petrol has risen from 988,427 gallons in 1920 to 1,381,671 gallons last year.

The horse-drawn vehicle is fast going out of fashion. The import of horses from India, Australia and England dropped to 188 animals last year from 317 in the preceding year.



E. C. Flader motor plow

Korea Will Buy from 200 to 400 Cars Each Year

Over 4000 miles of roads already built, with 3000 more in prospect. Manufacturers should have direct representation in Korea, as Japanese agents are usually inadequate. Touring cars selling for less than \$1,500 in demand. Truck market increasing.

By William R. Irvine *

NINETY per cent of the 800 motor vehicles in Korea are low-priced American makes and 75 per cent of these are used as motor buses in supplementing the railways of the country. The government recognizes the value of motor vehicles in developing the resources of Korea, and as rapidly as roads are opened bus lines operate over them under franchises granted by the government at fixed tariffs. Most of the remaining motor vehicles are used by missionaries—hardly more than a dozen Koreans owning cars for private use.

Practically all the roads in the country are under the supervision of the Government General which makes for uniformity in construction and supervision. Construction is now being carried on under a 20-year program which calls for 7706 miles of highway. When this program was inaugurated in 1912 there were but 583 miles of road in the country. Fifty-three per cent or 4060 miles of the program were already completed in 1920. These roads are unmetaled and about 25 feet wide. Motorists experience no difficulty in their use except during the rainy season during July and August, even though many of the new roads require repairs, the government concentrating its road appropriations on new construction. Streets in Seoul, the capital, and Fusan, the principal seaport, are wide and unsurfaced and during the greater part of the year permit driving without undue hardship.

Market Improving

The sale of motor vehicles in Korea is at present seriously handicapped by poor business conditions, but indications are that the market will soon improve despite the recent imposition of heavy import duties, due to the steady increase in road mileage noted above and the value of automotive transportation which is apparent in those sections where road conditions permit the use of motor vehicles. The market is further limited at the present time because the small wealthy class of Koreans have not yet overcome the fear that to show wealth means greater taxation by the government.

The automotive market in Korea, which is gaged by the crops—the country being almost entirely agricultural—will be limited for a number of years to motor vehicles falling within the \$1,500 margin, due to low buying power of the people, which however is increasing

with the introduction of scientific methods of farming. However this demand should be steady for the next few years for between 200 and 400 vehicles per year for both new cars and replacements, the latter being based on the average life of a motor vehicle of about four years under present operating conditions.

There are few artificial handicaps to the sale of motor vehicles in Korea and the recent increase in taxes and import duties are offset by the lowering prices of American makes. Present stocks of cars bought at high prices are very low and these were also imported under the old duties. Taxes are 120 yen per year regardless of horsepower or size, as compared with the old figure of 50 yen. Import duties are 35 per cent on passenger cars and trucks, 25 per cent on parts and a flat rate of 100 yen for motor cycles regardless of cost.

Business Practices

Dealers come into direct contact with the buyers. The chauffeur-evil which is so prevalent in Japan is not tolerated by automotive dealers in Korea. It is the general practice to demand cash sales with Koreans, although credit terms are sometimes given to foreigners, usually missionaries who require cars to get over their territory. Prices are generally in keeping with laid down costs and average about 75 per cent above the sales price in the United States.

Dealers do not maintain separate service stations for repairs, although some carry spare parts. Repairs are made by a machine shop in Seoul which has a fairly adequate supply of machine tools and is quite capable of making major repairs and in emergencies making essential parts. Very little advertising is done by dealers owing to the high rates demanded by the Japanese newspapers. Occasional announcements of new representations are made, but dealers prefer to circularize small folders. English advertising literature has a very limited use and it is suggested that advertising allowances be given to dealers on condition that it be expended on circular matter in Korean or Japanese script.

The center of motor vehicle distribution is at Seoul, where all the dealers and repair facilities are located. At the present time there are less than a half dozen dealers interested in the sale of motor vehicles in Korea although many more are supposed to be acting as representatives. American manufacturers make a mistake in granting Japanese representatives the territory of

*U. S. Trade Commissioner. Released by courtesy of Automotive Division, Bureau of Foreign and Domestic Commerce.

Korea unless the Japanese company can actually prove that it is represented in the country.

Credit terms would undoubtedly have to be given in the event that direct representation were placed in Korea, as the men in that country who are interested in automotive products have but limited capital. Dealers at present are paying from 10 to 11 per cent interest on loans. Terms granted in other lines are 90 days sight draft, with documents delivered on acceptance.

There are no regular steamship lines giving direct service between American ports and the Korean ports of entry, Fusan and Chemulpo (Jinsen). As goods imported through Japan must pay an additional 8 per cent duty, unless shipped in bond, it would be best to send them direct to Seoul by a bill of lading calling for transshipment at Kobe, Japan. Automotive vehicles should be carefully packed and specially braced when intended for direct shipment to Korea, as the unloading facilities at the above ports are very bad.

The accessory market is limited to utility articles.

The tire market, formerly controlled by British goods, is now in the hands of Americans; there is a steady demand for tires and tubes, as the tires commonly last less than 3000 miles. Dealers are advocating the use of oversize cords.

Types of Motor Vehicles in Demand

The demand for passenger cars is limited to touring types, including chassis and body. The local body building is limited to special touring-bus bodies for a light, popular-priced American car. The demand for trucks is chiefly for those of 1 and 1½-ton capacities, owing to the frail bridges of the country.

Most of the trucks in use are owned by the Government and the railroad. Merchants and minor manufacturers are beginning to use light trucks in the towns. The market for motor cycles will not increase to any extent as former owners have found them too uncomfortable over the rather rough gravel roads and are going in for cars.

Future of American Automotive Exports to Chile Depends On Manufacturers

THE stagnation which the Chilean automotive trade has suffered for nearly two years will perhaps never reach a lower ebb than has been experienced during the past few months, but it would be venturesome to say that any great improvement is yet in sight, according to reports received from Commercial Attache McQueen at Santiago. However, the nitrate industry has shown steady improvement for several months and better prices are being offered for Chilean copper. If these conditions continue, the general prosperity which will bring about real activity in automotive trade will undoubtedly follow.

Prior to 1913 Chilean purchases of motor vehicles were negligible because of the lack of good roads and modern pavements. The war prosperity, however, brought about a change which would have taken years of gradual development under normal conditions. The contrast between conditions in 1913, when probably not more than 200 motor vehicles were in use, and those in 1920, when the automotive census was estimated at 8000, shows the rapidity of this change. The degree of stagnation can be seen from the fact that only 14 motor vehicles were imported during the first five months of 1922 and but 219 during the same period of 1921 as compared with imports during 1920 valued at over \$1,200,000.

Future Demand for American Cars

The present stock of unsold cars on the market will number nearly 100, however, although it may appear rather large just now, this number will not greatly affect importations if a period of prosperity should set in. Nearly every agency still has a few cars on hand, the enclosed cars being the hardest to dispose of on account of their high price.

Some observers state that automotive imports will be small for several years, until the stocks are reduced to proportions more compatible with the normal purchasing ability of the country. This opinion is supported by the fact that cars generally see comparatively light service, since the radius of driving in the cities is small and the price of gasoline (about 50 cents per gallon) conduces to sparing use. Weather conditions are not adverse and

were skillful mechanics available, the life of a car in Chile would be much longer than in most countries.

There are no signs of competition which will deprive American manufacturers of any large share in the trade. European cars will no doubt reappear on the market and will be purchased by a few wealthy Europeans on the appeal of novelty and exclusiveness, the bulk of sales, however, will be among American low and medium priced cars which are able to negotiate the rough surfaces encountered away from the principal downtown streets of the cities.

Manufacturers Should Cooperate with Agents

Chilean automotive importers have had a difficult and unprofitable time for more than a year and their statements regarding the business are bitter, or at least regretful. Good agents, properly equipped and with adequate sales forces and service facilities, are very difficult to find or to replace if their interest wanes. The immediate future of American automotive exports to Chile rests largely with the American manufacturers who have maintained their organizations despite the dull times and it rests with them to go to some trouble to indicate their sympathy with their agents and offer some form of co-operation that will instil a spirit of optimism for the future. The lack of reliable and efficient representatives is illustrated by the fact that one very prominent American make is at present unrepresented in Santiago.

THE interest in Argentine oil reserves is increasing daily. Besides the Argentine government works at Comodoro Rivadavia and Plaza Huincul, eighteen companies are engaged either in investigations or actual exploitation. One of the more recent developments is the organization of a large company in Santiago, Chile, to exploit concessions near Challacó (Neuquen territory.) Up to date, no large new developments have taken place in the refining of gasoline but the plants in operation at Campana are gradually forging ahead with plans for greater things in this industry.

Motorless Flight Impossible as Transportation Means

Air sailing or gliding promises significant developments in aeronautics. Skilled pilots with thorough knowledge of air currents and ability to use them to advantage are essential for successful soaring flight. European competitions are described.

By Edward P. Warner

DESPITE the fanciful stories written by some of the correspondents concerning air-sailing, there is absolutely no outlook for motorless flight as a practical means of transport. But the remarkable achievements of this summer point to very significant developments in aircraft. In the first place, soaring and gliding flight will provide better pilots; it will enable them to keep in practice and will make them more skilled. In the second place, it will provide a quick and economical method of trying out new designs and forms of construction under actual flight conditions. Finally, it offers a means for the study and charting of air currents, at present practically unknown. Study of atmospheric conditions means more economical and safer flight. The great desire of commercial aviation is to carry a bigger pay load per horsepower of engine. At present a wide excess of power is necessary for reserve in case the craft meets unfavorable wind conditions. If conditions are known approximately it is evident this reserve can be very materially reduced. Again, many of the most spectacular and costly accidents, particularly in this country, have occurred while flying over regions subject to sudden storms or where the atmospheric conditions were likely to be bad without warning. It will be possible, by means of study from soaring planes, to learn more accurately the normal and abnormal conditions and thus match our airway on the ground with a literally charted airway above the ground.

The French competitions were held at Clermont-Ferrand, Aug. 6 to 20. France, Switzerland and the United States were represented. There were 49 entries. With the exception of the final three days, most of the flights were made from La Taupe, which is 3500 feet above sea level, but which has an actual drop of only about 200 feet. For the first five days of the meet the American entry, sponsored by the students of the Massachusetts

THE author of this article, who is Professor of Aeronautics at the Massachusetts Institute of Technology, has just returned to this country after witnessing the remarkable motorless flight contests held last month in France and Germany. He is believed to be the only American aeronautical engineer who has had this experience. The article is authoritative and free from the unscientific statements which have characterized many earlier reports.

Another article by Professor Warner dealing in an engineering way with motorless flight and closely related subjects, and written exclusively for *Automotive Industries*, is being prepared for publication in an early issue.

Institute of Technology, and flown by Edmund T. Allen, attracted most of the attention and was uniformly the most successful. Allen altogether made about fifteen flights, the longest 1 minute, 47 seconds duration. In taking off his machine was so damaged that he found it necessary to put his reserve craft into commission, but as this was not officially recognized by the French he could not remain in the competition. Trial flights with the new glider were nearly 2 minutes duration.

The most successful French entrant was Bossoutrot, chief test pilot for the Farmans, who, on the day previous to the meet had placed in commission a four-

engine Goliath, weighing 20,000 pounds, relinquishing it to pilot a glider with a total weight, including himself, of only 200 pounds. Bossoutrot made a sustained flight of 5 minutes, 18 seconds, which was the recognized French record. Later another Frenchman, Douchy, took off from a neighboring peak, Puy de Dome, 4700 feet above sea level, and with a straight drop of 1500 feet. He remained up 9 minutes.

The German competitions were from Aug. 9 to 24, from Wasserkuppe, the highest peak in the Rhone Mountains, with an elevation of 3100 feet. The most successful entrant (all were Germans, except two Dutch entries) was Hentzen, who flew the Hanover Technical School monoplane 'Vampyr,' remaining up for 3 hours, 10 minutes. The next successful was Hackmack, in the Darmstadt Technical School monoplane, whose time was 1 hour and 46 minutes. The two gliders were much alike, except that the Vampyr was controlled by warping the wings and the Darmstadt by ailerons.

The Germans have been experimenting with soaring flight ever since 1912, although, of course, there was an interruption during the war. I was amazed to observe the extent to which the Germans had studied atmospheric conditions around Wasserkuppe. The long flights were

the product of the exceptional terrain, excellent machines, good piloting, and knowledge of the wind currents. There was no magic. Most of the German fliers had been studying motorless flight for a considerable period. Hentzen, the leader, was a war pilot of great reputation. Martens, who also flew the Vampyr, had applied himself to gliding for three years.

As a general thing, most of the German machines were designed by aeronautical students at technical schools, though the manufacture in some instances was done in commercial plants. Most of the craft were monoplanes. The French craft varied in type and the rest were essentially sport machines, without motors. Contrary to popular belief, light wing-loading was proved not absolutely essential for efficiency. The French and German gliders ranged from $1\frac{1}{2}$ to $2\frac{1}{2}$ lb. per sq. ft. The most successful German glider had a wing-loading of 2.4 lb.

All the longest flights were made in a west wind, which blows up along broad slope. Hentzen, Martens and Hackmack made their records by taking advantage of rising currents of the same sort as utilized by Orville Wright, in October, 1911, when he returned to Kitty Hawk, N. C., to carry on further gliding experiments. Mr. Wright soared for 10 minutes and 1 second at that early date, an American achievement which has generally been forgotten. Whereas Mr. Wright took advantage of a wind flowing up the face of the hill at a speed equal to his flying speed, and thus was enabled to hover, the Germans did better by gliding into a wind flowing up the hill at a speed less than the flying speed of their craft. Hentzen took off in a 25-mile-an-hour wind, which was about his flying speed, but, on his two hour flight he remained aloft successfully even though the wind had by that time diminished to 15 miles an hour, or 10 miles less than his normal flying speed.

The Germans took advantage of the ascending current of wind to take off and then worked back and forth in figures of eight, but generally staying over the original slope and in the ascending current. Hentzen remained for most of this period in the air over the general locality he started from. Then having an altitude 500 feet higher than his starting point, and his machine possessing a very flat gliding angle, he glided down the valley of the Fulda for seven miles, in order to comply with the terms of the competition that he land at least five kilometers from his starting point. It was impressive that Hentzen, on his three-hour flight, actually soared 1150 feet above the point from which he took off.

As to the present position of soaring flight, the status, in my own opinion and that of most of the well-informed persons with whom I talked, is briefly this: The problem can be divided into three parts. The first and simplest is the utilization of ascending currents, which has been accomplished. All that remains in that direction is to devise means for detecting more accurately the presence and location of these currents. The second is to sail in winds of varying velocity. As Professor Langley, the American scientist, showed in 1898, it is theoretically impossible to take advantage of the "internal work of the wind" and of rapidly fluctuating wind speeds to support a bird or aircraft without loss of altitude or direct expenditure of energy, the necessary energy being drawn from the wind itself.

The problem of soaring flight, as it is commonly interpreted, may be said to have been solved only when flight without power in fluctuating winds and without use of ascending currents has been realized. The third and final stage is flight without power when the wind varies its speed at different altitudes.

Curtiss Glider a Flying Boat Adaptation

FOR two periods of thirty seconds each, Glen Hammond Curtiss recently remained aloft in his new sailplane, constructed of silk, wood and duralumin. In this test the sailplane was towed on the water but Curtiss believes that eventually it will rise without motive power from the surface of the water. The tests were experimental and preliminary to further, continued tests. Great satisfaction was expressed, however, in the manner in which the craft handled. This was the first time in five years that Curtiss has piloted a plane.

The test conducted off Plum Beach, Port Washington, Long Island is the result of long continued experiments carried on in the Curtiss research laboratory at Garden City, Long Island with the conviction that the flying boat could be adapted to sailing thereby lessening the horse-power and decreasing the cost of operation.

The sailplane was towed by a speed boat. Due to the excessive calm, difficulty was experienced with the towing cord, which snapped several times. On the third trial, Curtiss cast loose at a height of 20 or 30 ft. and in spite of the dead air sailed for half a minute.

On the trip back from the test while being towed, a cross breeze arose and for half the distance the sailplane floated in the air, held by the cord. At the end Curtiss cut loose and sailed to the hangar. A second test held more recently with slightly more favorable wind conditions resulted in approximately the same flight duration.

The Curtiss sailplane is a miniature N.C. boat, which may be remembered first crossed the Atlantic. Its dimensions are: weight (empty) 150 lb.; loaded (one man) 310 lb.; span 28 ft.; chord 60 in.; gap 54 in.; length-over-all, 22 ft. 11 in.; wing area, 267.5 sq. ft.; hull



The Curtiss sailplane

13 ft. $2\frac{1}{4}$ in. long, 30 in. beam. The hull is made of duralumin and the glider is designed to fly at 20 m.p.h.

The shoulder system of control used in the sailplane dates back to Curtiss's earliest flying days, for it was connected with the Aerial Experiment Association, which included such prominent men as Alexander Graham Bell and Lt. Selfredge, that he developed the aileron and shoulder yoke systems of control. Incidentally it was during this period of development work by the Association (1907-1909) that Curtiss carried on experimental work with his first glider at Hammondsport, N. Y.

It is now generally realized that flight performance does not depend solely on engine power and hence sailplane experimentation may have far reaching effects.

Handling Truck Sales and Service in the Small Town

Analysis of typical town of 7500 inhabitants proves market too small for exclusive truck dealer. Large portion of truck sales possibilities lie in such places. Fleet owner buying comprises only 10 to 15 per cent of total possibilities. Service must be given.

By Harry Tipper

THE distribution of commercial vehicles requires a thorough consideration of the buying potentiality of each section of the market and the methods of buying usually adopted by the business houses operating in those groups.

This includes the sale of the vehicles and the service necessary to maintain them after they are sold. No method of sale which neglects the element of service will prove of permanent benefit. The two functions, however, do not coincide and cannot be worked out in a way that will be found valuable in the passenger car work. To illustrate this difference take a town of 7500 inhabitants located about ten miles from a city of 100,000. This town has no manufacturing, it is simply a trading center. There are about 1200 automobiles and there are nine successful retail automobile establishments, selling cars, supplies, storing and servicing; one exclusive repair shop in addition, and two tire shops. Three of these establishments sell commercial vehicles. The market for commercial vehicles in this town is confined to

- 1 Laundry
- 4 Drug stores
- 6 Markets
- 3 Hardware stores
- 2 Delicatessen stores
- 2 Candy shops
- 1 Shoe store
- 2 Millinery stores
- 2 Toy, newspaper, etc., stores
- 5 Tailor shops
- 2 Lumber and building material retailers
- 3 Stone, gravel, etc., retailers—general contractors
- 3 Building contractors
- 2 Coal dealers
- 3 Express and moving

The present ownership of commercial vehicles among these various concerns is as follows:

- Drug stores—4 speed trucks
- Markets—5 speed trucks
- Hardware—1 speed truck
- Tailor shops—4 speed trucks
- Lumber—4 trucks
- General contractors—12 trucks
- Building—3 trucks
- Coal dealers—6 trucks
- Moving and express—6 trucks

The total number of commercial vehicles is 49 against a car ownership of 1200. The speed trucks are small and mostly Fords or similar types. The trucks vary from 2-ton to 7-ton in size. None of the trucks owned

by the moving concerns are less than 5 tons and the general contractors seem to prefer equally heavy loads for their work.

None of these owners of commercial vehicles have garage and repair equipment of their own. Therefore the service on these vehicles must be taken care of in the town through the medium of the present retail establishments servicing automobiles.

The requirements of new vehicles in this town for commercial purposes does not exceed five or six in the year for the present owners, and there is a possibility of increase of one or two more.

It will be seen at once that this locality with a requirement for commercial vehicles of a small amount does not offer a profit for the exclusive truck dealer, particularly as a number of the trucks in use are speed trucks and can be taken care of through the ordinary automobile passenger car distribution. The sales, therefore, must be made either through the retail establishments already in this locality, or from the larger city near which the town is situated.

This is the story of only one small town, but it is indicative of the condition in many others and illustrates the widespread possibility of the market for commercial vehicles where a concern can own only one or two. In many of these small communities, however, there is no possibility of conducting sales from a nearby larger center of population because of the distances.

The market for future commercial vehicles depends, of course, very greatly upon the service facilities available in the locality for keeping these vehicles moving. This leads to the conclusion that for many areas in the United States, in the majority of smaller towns, retail distribution and the sale of commercial vehicles is necessary to the covering of the market; and to the further conclusion that in a large number of these small towns the possibility of truck sales in any given year is not sufficient to enable a retailer to specialize exclusively upon that development.

In the last article on this subject it was stated that there were over a million retailers of which about 300,000 represented retail establishments with a maximum limit of approximately one delivery vehicle and about 300,000 representing a maximum delivery requirement of from one to three vehicles, and approximately 10,000 concerns with a delivery requirement of five or more.

To reach a large number of these retailers and local

concerns, it is necessary that the service point be within the local area because the commercial vehicle must be maintained in shape to continue its way through the working day. Service must be rendered so that the driver can put the car in the service garage and take it out without any loss of time necessary for the business operations.

The number of truck sales to be made in any given sales period, such as a year, with such a local area, is not sufficient to permit the specialized effort dealing only with those sales, unless such sales are made by a salesman from a distance without the possibility of demonstration and with the limited contact to be secured in that way.

Such methods would probably prove uneconomical in a final analysis, bringing the manufacturer back to the retail establishment, not exclusively maintained for commercial vehicles, in order to reach the market in smaller towns and cities. The market provided by the 10,000 retailers who are in a position to use five trucks or more, and the additional market provided by the industrial concerns and commercial haulers also capable of using fleets of five or more, must be tackled in a different manner.

Most large retailers, such as department stores and most industrial concerns having large delivery problems, or haulage problems, are accustomed to buy direct from the manufacturer in all their business transactions involving any considerable expenditure.

This method of buying obtains a good deal at present in connection with the buying of commercial vehicles and it is likely to continue because the investment in commercial vehicles is an item of sufficient importance to demand attention and specialized consideration is developing in all cases of this kind.

The system of retail distribution required for the smaller cities and towns and for the ordinary demand for commercial vehicles will not fulfill the purpose in connection with this part of the market so that other methods of distribution must be considered.

There are a number of towns in the United States of between 10,000 and 100,000 inhabitants with two or three department stores, a number of building contractors, coal dealers, general contractors, moving, express and warehouse concerns, who are able to use a number of trucks. These concerns do not necessarily buy from the manufacturer unless their requirements in any particular purchase are unusually large.

Their buying will tend to concentrate more and more within the local area, provided the retail

establishments serving the automotive business within that area are capable of supplying their needs and rendering the service which they cannot render in their own garage and service stations.

Commercial haulers having terminals in such cities—if they are successful—will have a sufficient requirement for trucks and the truck will be a sufficiently important part of their total investment, to demand direct consideration from the manufacturers in most cases.

In larger cities, the industrial buyers of trucks and commercial vehicles with considerable requirements, their own system of garage and repair, and extensive systems of delivery; the big retail companies, big contracting companies and similar organizations—will continue the method of buying direct, especially where they have adequate service facilities of their own, including repair shops.

This very brief consideration of the distribution does not take into account the rural market which must be served, of course, from the trading centers situated in the rural area, and through the retail establishments capable of selling and servicing the automotive vehicles within the trading area.

It is estimated that there are in the United States 15,000 concerns who are fleet owners; that is, who own five or more vehicles. The total ownership in this group does not represent more than 10 to 20 per cent of the total number of commercial vehicles in use in the United States at the present time. There are no reliable estimates as to the use of commercial vehicles in various lines of business. There are in use approximately 1,500,000 vehicles devoted to commercial purposes in addition to the passenger car vehicles required for business. The general retail field, comprising all kinds of retailers, uses about 500,000 of these or 30 per cent of the total market. This is an approximate figure secured from the best possible estimates of a fragmentary kind that have been made from various sources. It is probable that the requirement of commercial vehicles for concerns in all parts of the United States outside of the farm market for one to three vehicles per concern represents a much larger proportion of the market than the total market represented by the concerns whose delivery requirements necessitate the use of five or more.

For this reason, consideration has been given in the present article to the necessity for retail distribution from the present distributing facilities and service facilities in the smaller towns and cities.

The next article on this subject will go into detail in considering distribution development and systems required for the market represented in the larger cities and in the specific industries.

Aircraft Activities Decrease

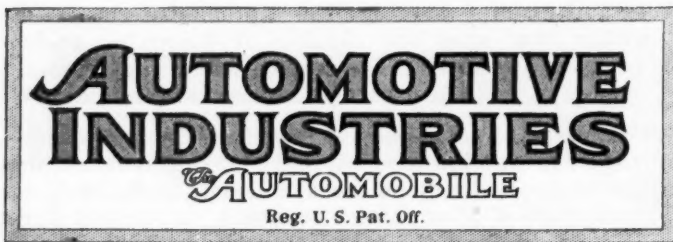
WASHINGTON, Sept. 2—Lessened activity in the aircraft industry is illustrated in the report of the Bureau of Census showing a decrease in the total value of products amounting to 54 per cent in 1921 as compared with 1919. There were 31 establishments in operation in 1919 producing aircraft products to the value of \$14,372,643 as against 19 establishments producing aircraft products valued at \$6,616,988.

In 1921 as compared with 1919, there was a decrease of 148 or 34.3 per cent, in the number of airplanes manufactured, but there was an increase of \$332,888, or 9.6 per cent in their total value. For seaplanes there were decreases during this period both in their number and value,

222, or 96.5 per cent, and \$4,269,948, or 93 per cent, respectively.

The combined output of all establishments was approximately 27.6 per cent of the maximum capacity, based upon a demand requiring full running time. The percentage of output of individual establishments ranged from 5 to 75 per cent of their maximum capacity.

The detailed record of production shows that 284 airplanes valued at \$3,799,340 were produced, in 1921, and 8 seaplanes valued at \$310,068. The records show that 369 planes were under construction in 1921 having a value of \$959,567. The total value of airplane engines produced amounted to \$22,590 and of parts the value was \$778,111.



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Good Crops Mean Car Sales

ESTIMATES of the Department of Agriculture, that the important farm crops will be worth \$1,250,000,000 more this year than they were last, made pleasant reading for the automotive industry. It was conclusive proof, if further evidence was needed, that the farm market for motor vehicles will be gratifyingly good for the coming twelve months. Agriculture is much better off at this time than seemed possible even six months ago.

Rural demand for any manufactured product naturally is more or less "spotted." It depends to a certain extent on local conditions. Weather freaks are responsible in large measure for good or bad crops and nothing in the universe is more freakish than a meteorological map. As a consequence harvests may be good in one county, which was skipped by a devastating storm, and bad in the counties on either side which were hit by it.

For this reason, if no other, automotive manufacturers must analyze rural markets carefully and their studies should be accompanied by frequent reference to crop reports from each county in the state they are considering. There is a certain amount of sameness about these reports, to be sure, and they scarcely would be selected for light summer reading, but they tell a mighty interesting business story.

Here are the estimated values of the three principal crops:

Corn, \$1,801,000,000, an increase of \$496,000,000 over last year; cotton (exclusive of seed), \$1,064,000,000, an increase of \$389,000,000; wheat, \$720,600,000.

It needs no argument to prove that the districts which raised these crops, leaving their other products out of consideration entirely, will offer splendid markets.

Secondary Inflation

THERE are a good many persons who assert that price cuts demoralize the motor car market and that they prove the industry is engaged in a price war. These conclusions are based on false premises. The extraordinary sales of the past six months demonstrate that the market has not been demoralized and the profits shown by the manufacturing companies prove that they are not taking part in a ruinous price war.

The reason that the automotive industry is in a stronger position to-day than any other is that it has deflated itself and made a thorough job of that painful process. It has passed its economies on to the ultimate consumer who is showing his appreciation by buying liberally.

This policy, in the face of an insatiable demand for cars, is in marked contrast to that of other industries whose price lists have been barometers reflecting the almost daily rise and fall in demand. Automobile prices, in the main, have gone steadily in one direction and that has been down. They have not been lower one day and higher the next. Prices have been lowered in spite of slowly rising manufacturing costs. Profits have been made by increasing production instead of prices and that is the rock on which sound business is built.

Bankers in all sections of the country are beginning to express concern over the inflationary tendencies of industry as a whole. It was economically inevitable that there should be a secondary period of inflation and it is equally inevitable that it will bring grief in its wake just as did the period of inflation which followed the war. Fortunately for our own industry it is not involved at this time.

Discussing this inflationary tendency in its relation to the rail and coal strikes, the Cleveland Federal Reserve Bank sounds this badly needed warning:

"Some lines of business were only needing an encouraging excuse to return to former inflationary tendencies; evidences are beginning to be seen that

the coal and rail strikes are furnishing those encouragements. Two months ago we pointed out certain disturbing under-currents whose unchecked tendencies would hinder our return to business readjustment. The first of these was a growing tendency of increased cost of production paralleling increased production. The second element was that the larger facilities occasioned by war-time expansion was a constant encouragement to over-production.

"The third element mentioned at that time was the persistent report of labor shortage, together with the returning evils of bonuses and the offering of premiums. The first and third of these tendencies have not been checked; in fact, they are rapidly growing. The evidences now are that the manufacturers we had in mind at the time have seen the danger of over-production and are protecting themselves.

"We should not be carried away or deceived by the rush of increased business activity that will follow the temporary settlement of the coal and rail strikes. Such activity will be uneconomic; it will be as the inrush of air filling a vacuum caused artificially by an air pump. Business has been artificially interrupted, and the effort to readjust itself to where it would normally have been at this season of the year might well deceive the unthinking."

What Makes 'Em Shimmy?

AMONG the puzzling problems which arise in service work to-day is that involved in remedying the phenomenon to which certain cars are subject and which is popularly known as "shimmying." When this trouble occurs the whole front end of the car takes on a violent transverse oscillation, which, it would seem, is sufficiently severe in some cases to well-nigh shake the car to pieces and perhaps put it out of control in respect to steering.

The trouble occurs, or at least starts, when the car passes over a rough or especially a corrugated strip of road, but is entirely distinct from the up-and-down motion which such a road may cause. The driver instinctively grabs the wheel tightly, endeavoring to hold the car to its course, whereupon the shake increases in violence unless the brakes are applied and the car brought almost to rest. If, however, the driver allows the wheel to go free the shake ceases almost at once, at least in some instances.

This fault is not confined to any one make of car, nor is it common so far as we have heard to any large number of cars of some particular model. If it is due to some structural weakness, it apparently is not the same one in all cases. It may be due to slight differences in fit or assembly or to faulty design. In one case which came to our notice the trouble was rendered less severe, but not entirely stopped by slightly altering the angle or fore and aft tilt of the axis of the knuckle pivots. The upper end of these was further aft than the lower end both before and after the change, but more nearly vertical in the better position.

Various hypotheses have been advanced to explain

the trouble. It is said to be due to wear in certain instances, but it is probably due to structural faults in other cases. What are these faults and how can they be avoided, or remedied, when and if they are inherent in a given design?

It would be interesting to know the basic cause of the phenomenon or why it is set up, once the conditions which accompany its occurrence are established. The subject was discussed at some length in an article by A. Ludlow Clayden, which appeared in these columns on Aug. 26, 1920. This article was later supplemented by a letter in the issue of Oct. 6, 1921. We shall be pleased to receive, preferably for use in the Forum, further authoritative discussions of this subject, especially particulars concerning any practical experiences which have led to a solution of the trouble in particular cases.

"Orphans"

DON'T dump old discontinued car and truck models into foreign markets.

Provide adequate service for all vehicles shipped abroad.

Don't ship vehicles to foreign countries without sending a reasonable number of parts with them.

Take care of "orphans" in the foreign field.

THESE are a few of the axioms for automotive manufacturers that can be drawn from some recent experiences of the Automotive Division of the Bureau of Foreign and Domestic Commerce. The division is making strenuous efforts to make every foreign owner of an American car or truck feel that he can secure spare parts through the assistance of government representatives if the regular channels fail him. The Automotive Division has already done considerable service of this character. It places the requests in the hands of appropriate manufacturers or in the hands of parts makers when the particular manufacturer has gone out of business.

This work is done to strengthen the prestige of American automotive products in foreign countries. It is certain to have a definitely favorable effect. That effect can be heightened by the co-operation of manufacturers. An excellent example of how co-operation can be extended is given by a recent instance. A certain truck company temporarily suspended operations some time ago due to financial troubles with the result that the owner of one of these trucks in England was unable to secure spare parts from any distributor in that country. The assistance of the local consul was employed with the result that the parts were immediately secured through the present reorganized company. In writing to the Automotive Division, the truck company added, "We wish to thank you for bringing this case to our attention and to assure you that we are putting forth every effort to supply all — owners with the best service possible."

This is the spirit of constructive co-operation which must permeate sales and service activities in foreign fields if American automotive exports are to continue to grow and to make a profit for our manufacturers.

August Production Totaled 272,000

Exceeded July Mark; Came Close to June

Ranks Second in History of Industry—1,003,000 Four Months' Aggregate

NEW YORK, Sept. 12—August production of motor vehicles totaled 272,000, according to reports to the National Automobile Chamber of Commerce. This total gives August, 1922, the honor of being the second greatest production month in the history of the industry and 12 per cent over July, 1922, which had ranked second to June, 1922, the record holder.

This report makes the fourth consecutive month that the production record has been smashed and places May, June, July and August, 1922, in positions of honor at the top of the record list. June heads the list with 289,000; August is second with 272,000; May is third with 256,000 and July, fourth with 246,000. The total production for the four months is 1,063,000, more cars and trucks than the industry every manufactured in any one year up to 1916, when the million mark first was reached.

Compared with August, 1921, the latter month looks like a pygmy, for this year's August is 53 per cent greater than the one 12 months ago.

These figures are more complete than usual, for nearly 99 per cent of the shipping statements were in when this estimate of production was compiled by the N. A. C. C.

George P. Smith Chosen Head of Mercer Motors

NEW YORK, Sept. 7—At a meeting of the board of directors of the Mercer Motors Co., Trenton, N. J., George P. Smith of Smith & Gallatin, brokers of New York City, was elected president to fill a vacancy which has existed since the company severed relations with Hares Motors.

R. W. Barnum was chosen vice-president in charge of production and finance to succeed H. E. Barthel, resigned. Barnum was formerly vice-president and general manager of the Barnum-Richardson Co., iron manufacturer of Lime Rock and East Canaan, Conn., and for the last three years has served as general man-

Business in Brief

Taking the July reports as a basis for their optimism, financiers predict that the railroads will be able to meet the fall crisis in transportation. It is felt that the carriers met the test of the strike, the proof of it being that July showed unexpected earnings, despite the handicap of reduced shop forces. The usual congestion of traffic in the middle of October is expected.

Analysis of the weather, crop and trade reports shows general sentiment is better. Jobbing and retail trade have survived the hot weather in certain sections, although prices are uncertain. Buying is conservative, with business improving in the coal regions.

Corn has been affected by the heat and drought and cotton, by the boll weevil. Cotton is lower but future sales are not strong. Grain prices show a slight improvement.

Some of the New England cotton mills have speeded up production but are hampered by price uncertainties in both raw and manufactured material. Buying of textiles lags.

Soft coal prices have eased in some places and quotations are \$1.50 per ton lower at some of the leading ports and \$2 to \$3 below two weeks ago. Anthracite quotations are nominal. Coke is \$3 to \$4 below a month ago, but triple the figures of a year ago.

Pig iron factories are showing a tendency to get back to normal, while the steel plants are improving their output. Uncertain deliveries have affected buying generally, except perhaps in structural material.

Car loadings for the week totaled 890,838 cars, an increase of 24,619 over the previous week. This was the largest number of cars loaded during any week since Oct. 1, 1921.

Bank clearings were favorable, the week ending Sept. 7 showing an aggregate of \$5,762,866,000 against \$5,637,969,000 last week and \$4,782,065,000 in this week last year.

ager of the body department of Mercer Motors in New Haven.

W. A. Smith was elected vice-president in charge of sales and service. He has been connected with the company in various capacities for the last 12 years, and for the last year and a half has served as general sales manager.

No Seasonal Slump As Midsummer Ends

Surplus Stocks Absent—Sales in Rural Districts Have Exceeded Expectations

By JAMES DALTON

NEW YORK, Sept. 12.—Midsummer is gone and it brought no seasonal slump in the sale of automobiles. The coming of September has been attended by no curtailment of output. August production was really sensational and closely approached the level of June, which established a new high mark for the industry with 289,000. Specifications given parts makers for this month by passenger car manufacturers in all price classes are larger than they were for August.

With a record of more than 1,000,000 motor vehicles made in four months it is scarcely to be wondered at that the public is considerably mystified as to what has become of them. The simple fact is that they have been sold. No surplus stocks have been accumulated either in warehouses or on dealers' floors. Some slight allowance was made last month by manufacturers for the delays incident to the rail strike and freight congestion so that dealers would be able to have a few cars on hand but practically all of them had been sold by the time they were received.

Material Orders to Jan. 1

It is possible, also, that the imminence of a severe freight car shortage has been accountable for some material orders placed for delivery this month, but by far the larger part of them are for use to meet current demand. Most manufacturers have made commitments running through October and November and a good many up to Jan. 1. There is not the slightest reason to think, however, that the industry is running wild and turning out products for which a market is not in sight.

Sales in rural districts have been larger than was expected and have practically counterbalanced any falling off in urban centers. Prospects are that the farm market will grow steadily stronger for the next three months. Farmers generally are finding them-

(Continued on page 545)

Detroit Makers Add to Plant Facilities

Many New Buildings Under Way to Provide for Greater Pro- duction Capacity

DETROIT, Sept. 11—Many millions in new buildings will be made ready for the industry in the remaining months of this year and the early spring of 1923. With the announcement by Dodge Brothers of a new eight-story body and assembly building, practically every large maker in the middle class or low class field is now definitely committed to the expansion of plant facilities. Though the expansions are largely to permit of increased closed body production, they likewise mean that general production capacity will be larger.

Hupp Increases 50 Per Cent

Besides Dodge Brothers, the Hupp Motor Car Co. has recently announced the addition of a new manufacturing building which will give it about 50 per cent added production space. The Ford Motor Co. is contemplating the erection of assembly plants at Jacksonville, Fla., and Minneapolis in the United States, and at Tampico, Mexico. The Canadian plant capacity is to be doubled by 1923 through additional factory buildings, and the Manchester and Cork plants in the British Isles are being extended.

Work has been started on a one-story addition at the Lincoln Motor Co. plant, which will be 1600 feet long and will be used for general production. No formal statement has been made by Ford officials as to the extent Lincoln production will be increased, but the size of the building under way would indicate that Ford is beginning to put into effect plans which will place the Lincoln on a larger production basis.

Columbia Motors, with the acquisition of the former Saxon plant, is in a position to triple its former production. Wills Sainte Claire is adding factory space for the special painting and finishing of its cars. The Buick Motor Co., with the addition of the former Scripps-Booth plant, has doubled its former production capacity. A new body plant is being built at Flint by the Chevrolet Motor Co., which it will lease to the Fisher Body Co., for the exclusive production of Chevrolet body work.

Durant Program Biggest

The Durant building program in the district is the largest of all. In Flint, the buildings to be constructed for the Flint Motor Car Co. alone will cost approximately \$1,500,000 and will cover, when complete, 37 acres of ground. In Lansing, the buildings for the Star and Durant four are nearing the point where production will begin, giving capacity for about 300 daily of the former and 150 daily of the latter.

The Gray Motor Co. has started the erection of an additional assembly building in Detroit which will give it capacity

Inventories of Material and Supplies Should Be Built Up Now to Last to Feb. 1.

By J. H. MAIN,

Director, Purchase Section, General Motors Corp.

Detroit, Sept. 12.

THE winter months of this year will probably present many difficulties in obtaining deliveries of material and it is important that a sufficient inventory of material and supplies be built up at once to carry through the factory until at least Feb. 1.

At present, though there is much difficulty in getting deliveries, it is possible to maintain an even balance of stock by ordering early and keeping after the railroads until the material is placed upon the factory siding. Companies which are doing this are not encountering shortages.

With the coming of cold weather and snow the railroad situation will become very acute and, with the burdens already imposed by the strike, it will be extremely difficult for the railroads to make satisfactory deliveries. To meet this condition it is necessary to make provision now if uninterrupted operation of the automobile factories is to be expected.

Manufacturers should determine upon a schedule of winter operation based upon actual sales requirements and build up an inventory between now and Nov. 1 which will carry them through on this schedule until February. It would be unwise to stock up beyond the actual sales requirements but it is almost certain that unless they build up a required stock they will not be able to operate continuously.

Prices may be expected to advance slowly but steadily so that no anticipation need be felt over possible declines. General Motors at the present time is buying on a four months' basis, and in some special cases on a five and six months' basis. This time is necessary to give the parts maker an opportunity to acquire his material and manufacture his product. Normally a six months' buying basis is the most satisfactory arrangement, with definite commitments made by the car maker every month. There is no reason why the industry should ever order on a longer time basis than six months.

There is no shortage of coal for ordinary power purposes now and prices have started to fall. There is a shortage of the better grades of coal for the production of coke, and with coke short it becomes difficult to obtain pig iron and steel. In spite of these shortages, manufacturers who have ordered early are being taken care of and there is no serious problem to consider.

in this district of about 200 daily. Similar assembly plants in Oakland, Cal., and Albany, N. Y., planned for operation before the season of 1923, will give a production capacity of about 100 daily in each plant. Philadelphia also has been mentioned as the site for an assembly plant which may be started this year.

There has been no expansion of truck manufacturing facilities in this section, because most of the plants were built to meet war time conditions. Truck business is showing steady gains, however, and makers are optimistic over the possibilities of putting most of their plant space into operation by the spring of 1923.

Aside from the building movement in the car plants, there have been large additions in the body field, many of which are now in construction, notably the Wilson and Fisher plants. In the parts field expansion has been held to a minimum, the most noteworthy exception being the increase in plant space at the Muskegon factory of Continental Motors.

Muzzy Lyon Co., manufacturer of bearings and babbitt alloys, has moved into a larger factory in Detroit, the fourth time since its founding in 1899. The new factory covers 36,000 sq. ft., and, with new equipment, will give the company double capacity. Even with additional space, the company is compelled to run night shifts in some departments to keep up with business.

Ford Plants Abroad Gained During July

DETROIT, Sept. 9—Four of the six foreign plants of the Ford Motor Co. showed increases in output in July in comparison with June. The most notable gain was in the case of the Cadiz plant which built 753 cars and trucks in July as compared with 486 in June. This is the highest output mark of this plant this year and three times higher than any month in 1921.

Production at Bordeaux jumped from 1141 cars and trucks in June to 1266 in July. Sao Paulo, Brazil, showed a small increase and set a new high mark for the year. Manchester built 2409 cars and trucks in July, leading all foreign plants. Buenos Aires built 572 cars and trucks as compared to 496 in the previous month.

A new daily output mark for tractors was made on Aug. 11 when 520 were built at River Rouge. In July, 9657 tractors were built for a new monthly high mark.

FLINT UNIT UNDER WAY

DETROIT, Sept. 8—The first unit of the new Flint Motor Car Co., organized by W. C. Durant, is now under way and should be completed, according to contract, by July 1, 1923. This unit will be 900 feet by 80.

Rates on Shipments of Bodies Reduced

Efforts of Associations Bring
Change Ranging from 20
to 67 Per Cent

NEW YORK, Sept. 11—A substantial reduction in freight rates on automobile bodies, ranging from 20 to 67 per cent, is announced by the Consolidated Freight Classification, representing all of the railroads of the country. The new rates are effective about Nov. 15.

These reductions are the result of 18 months effort on the part of the Motor and Accessory Manufacturers Association, the National Automobile Chamber of Commerce and the Automobile Body Builders' Association to convince the railroads that automobile bodies should take the same ratings as horse drawn vehicles. Representing the traffic department of the Motor and Accessories Manufacturers Association, Herman Deuster appeared before the classification committee four times before the contention of the automotive industry was approved and his perseverance rewarded.

Considerable Saving to Dealers

Automobile dealers who sell chassis and fit special bodies will be financially affected for the new rates will mean a considerable saving. For instance, a San Francisco dealer selling a Ford chassis and ordering a sport body from a body factory at Owensboro, Ky., would have to pay \$96.20 freight under the present classification. Under the new rate the charge would be \$32.10. In the case of special bodies there would be no saving unless the dealer filled the car; then he would save 20 per cent.

There are three divisions of railroad territory represented in the rate classification. "Official" represents all of the carriers east of the Mississippi and north of the Ohio river and the Mason and Dixon line. "Southern" is everything east of the Mississippi and south of "Official," while "Western" is everything west of the Mississippi.

Various Classifications

The following table shows the percentage of reductions in the various classifications:

	Off- cial	South- ern	West- ern
In boxes, or crates, see Note: Packages exceed- ing 54 in. in height, actual weight, but not less than 1,000 lbs. each, L. C. L.....	*....	*....	20%
Packages exceeding 44 in. but not exceeding 54 in. in height, actual weight, but not less than 1,000 lbs. each L. C. L.....	25%	33 1/3%	33 1/3%
Packages exceeding 36 in. but not exceeding 44 in. in height, L. C. L.....	50%	50%	50%
Packages exceeding 34 in. but not exceeding 36 in. in height, L. C. L.....	33 1/3%	50%	50%

THREE NATIONS OFFER GLIDER TEST PRIZES

NEW YORK, Sept. 12—Three countries have now offered prizes for glider competition flights. These countries are England, France and Germany.

The British prize of 1,000 pounds this year and 5,000 pounds next year is offered by the *Daily Mail*. Oct. 16-21 is the date set for this year's contest. The prize is for the longest duration of gliding flight of not less than 30 min. duration, to be made at a specific place not yet divulged.

In France, André Michelin has offered a 15,000 franc prize. Among conditions laid down are: Flight must be of 12 1/2 miles distance and the angle of descent of the glider must be less than one in 12.

The German *Tageblatt* has offered a prize of 100,000 marks for the longest distance flown cross-country in a glider by a German pilot in a German built machine. The offer remains open until Sept. 1, 1923.

Packages not exceeding 34 in. in height, L. C. L....	50%	66.7%	66.7%
Loose or in packages, C. L., min. wt. 10,000 lbs. subject to Rule 34.....	120%	120%	120%

NOTE—The height measurement of the package, or of the body if shipped loose, is to be taken with the body in its natural upright position.

*No change.

†Estimate.

Cleveland Production May Be 10,000 in 1922

CLEVELAND, Sept. 11—For the first seven months of the year the Cleveland Automobile Co. shipped about 6600 cars and for the past two months shipments have been at the rate of 275 a week. It is expected that the total production for the year will total 10,000 cars.

After inventory adjustments and other charges were deducted, net profits for the first seven months are reported to be in excess of \$1,000,000. With business continuing as anticipated for the balance of the year it is expected the company will earn \$2,000,000 for 1922, equivalent after preferred dividends to nearly \$7 a share on the 280,000 shares of no par common stock outstanding.

ROLLS-ROYCE BODY PLANT

SPRINGFIELD, MASS., Sept. 12—Rolls-Royce of America, Inc., now has its new plant for the manufacture of bodies in full operation, it was announced to-day. As a result, the company finds its production of cars facilitated, and it is said that the output for September will be in excess of August figures. S. deB. Keim, general sales manager, has left for an extended tour of the West.

Dunlop Tire May Sell \$10,000,000 in Bonds

Issue Would Be Guaranteed by
British Company—May Oper-
ate Buffalo Plant

NEW YORK, Sept. 12—The Dunlop Rubber Co., of London, announces that, following its policy of financing its foreign plants first with British capital and later opening the way for investors of the country where the branch plants are located, it may offer a bond issue of \$10,000,000 or more in the United States before the end of the year.

The bond issue in question likely would be a first mortgage on the Buffalo plant, but, in addition, would be guaranteed by the British company. In order to make proper provision for this guarantee the English company has canvassed the holders of its £3,000,000 of debenture stock, which now is on deposit with British bankers as collateral for loans which, it is understood, were made principally to finance the construction of the American plant at Buffalo.

The plan is to have this debenture stock remain on deposit as collateral for the American bond issue. A bonus of 1 1/2 per cent in cash would be paid holders of these debentures in the event the stock was used for any other purpose for which it now is deposited.

From this it is assumed that the Dunlop company is considering operating the big plant at Buffalo which was built at Buffalo two years ago at a cost of \$20,000,000 and which has never been in production because of the poor condition of the tire business at the time of the shut down.

Barling Bomber Plane Soon to Have Try Out

WASHINGTON, Sept. 11—The W. E. Barling bomber plane, now in course of construction, soon will be tried out at Fairfield, Ohio. It is the largest airplane built in the United States. The work is being done by the Whitemann Aircraft Co., Hasbrouck Heights, N. J.

The bomber is a triplane with a wing spread of 127 ft. and carrying six Liberty motors, totaling 2400 hp. It will have an estimated speed of 100 m.p.h. and a carrying load of 20,000 lbs. The six motors are set in three pairs, with one puller and one pusher in each group. The total weight of the machine, including the carrying load, will be 30,000 lbs. A cruising radius of 1300 mi. is called for in the specifications.

GOOD HUDSON-ESSEX AUGUST

DETROIT, Sept. 11—August was a good month for Hudson and Essex, the company having shipped 7100 cars. It is estimated that the final results for 1922 will show about \$7 a share earned on the capital stock against \$2 a share now being paid.

11 Chassis Comprise British Maker's Line

Wolseley Announces Engines of 6 Different Sizes—36 Varia- tions of Body Work

LONDON, Aug. 28 (*By Mail*)—The 1923 program of Wolseley Motors, Birmingham, one of the half dozen largest motor manufacturers in England, just issued, is claimed to be unparalleled in its range. It includes eleven distinct chassis with engines of six different sizes (7, 10, 14, 15, 20 and 24 hp.), 36 variations of body work and optional equipments accounting for 41 different list prices.

And beyond all this the various types of bodies, with a few exceptions, are to be made available in any one of a range of color finish.

Prices throughout show big drops. The 15 hp. as a four passenger is to be £660 on Sept. 1 as against £795 to-day; as a sedan, £895 as compared with £1025. Either of these can be had on a 52 in. or a 56½ in. track, the latter at a higher price. The 20 hp. six, five-passenger drops from £1,200 to £995 and the sedan from £1,500 to £1,300.

An entirely new model is the 14 hp., though it differs mainly from the 15 hp. in having an L head engine instead of an overhead camshaft; the bore and stroke are the same. The price of the four passenger is £525, at which figure it has good prospects of becoming the most popular Wolseley model and, further, will cut seriously into the market of the four-passenger light car makers.

All-Steel Business Sedan Being Produced by Dodge

DETROIT, Sept. 11—A new all-steel business sedan is announced by Dodge Brothers. It will sell for \$1,195, or \$250 under the price of the previous sedan model which it replaces. The feature of the new body model is the use of steel for the entire body construction with the exception of the roof, which is of fabric construction not subject to rumble.

The finish is baked enamel instead of that obtained by the 18 hand rubbing and painting operations formerly used, and this making it possible to mature the jobs in five days instead of ten. The upholstery is leather.

The rear seat cushion, rear side and back cushions are separate units, converting the entire rear section of the car into a spacious carrying compartment.

The front seat tilts forward, affording clearance through the rear doors. This gives a door opening large enough to admit a trunk or parcel 22 in. wide by 48 in. high. The plate glass window in the rear is unusually large, being 16 by 28 in. The rear quarter windows are 20 by 23 in., while the rear doors have

TRACTOR SALE GAIN REPORTED IN SOUTH

ATLANTA, Sept. 13—According to a compilation of sales reports from seven of the largest wholesale distributors of power farming equipment in the Southeast by the Federal Reserve Bank of Atlanta, sales during July of this year were 158.6 per cent better than July, 1921, though 7.4 per cent lower than June, 1922.

While definite sales figures for August are not yet available, sales are expected to exceed those of July, and be about 160 per cent better than Aug., 1921. This report includes all farm implements, but the increases are due to greater tractor sales principally.

a window opening of approximately 19 by 21 in. The front doors have an opening of 19 by 20 in.

The car is fitted with artillery wheels, cord tires, window regulators, windshield cleaner, dome light, heater, Yale door locks and the usual closed car equipment. The Yale lock operates with a thumb turn on the inside and a key on the outside.

Plant Addition for New Bodies

DETROIT, Sept. 9—The new addition to the Dodge Brothers plant is designed primarily to facilitate the construction and finishing of the company's new all-steel bodies, which it is adapting to its closed cars. The building will be eight stories high, will provide 440,000 feet of floor space and will cost \$1,500,000.

Needed space for the assembly, enameling and storage of the all-steel bodies will be provided. Many large presses and large electrically heated enameling ovens will be installed. With the addition of the new building the production capacity of the plant will be increased to about 1,000 cars daily.

Davis Adds Refinements to Phaeton and Sedan

RICHMOND, IND., Sept. 11—Added refinements and extra equipment, which will be standard for the Davis model 71 phaeton and model 74 sedan in the future, have been announced by the George W. Davis Motor Car Co. of this city. There will be no increase in the price of these models.

The phaeton is finished in either midnight blue or royal blue, at the option of the buyer and equipped with either aluminum military steps and skirt fenders, or with regular runningboards. Snubbers, both front and rear, polished aluminum luggage rods on the rear body panel, front bumper and brown Spanish leather upholstery are now standard on this model.

The sedan is equipped with snubbers, front and rear, and front bumper.

General Will Double Production Capacity

Now Making 2200 Tires Daily— Plans Rearrangement of Equipment at Plant

AKRON, Sept. 11—The General Tire & Rubber Co., which is doing more business to-day than ever before in its five years of existence, will double its present production capacity so as to keep output apace with orders, according to William O'Neil, vice-president and general manager. General now is making 2200 tires a day. The company plans to spend nearly \$200,000 on new buildings and new equipment.

By employment of unique business methods the General company was one of the few companies in the tire industry which did not suffer severely from the automotive slump and which did not temporarily abate dividends. Stressing dealer business in preference to original equipment business, and not permitting its dealers to over stock with tires, the company did not have any big surplus of tires on hand and was able to liquidate its finished goods inventory without materially cutting production.

To-day the company has over \$600,000 in cash and securities, a surplus of \$800,000, no indebtedness and in addition has met all its dividends.

General sales for the first three quarters of the company's current fiscal year will run between \$5,500,000 and \$6,000,000.

Doubling the present plant capacity will be accomplished largely through rearrangement of present equipment and installation of some new equipment.

National Axle Begins Making 8-Wheeled Bus

SAN FRANCISCO, Sept. 11—The National Axle Corp. of San Jose, Cal., is beginning the manufacture of eight-wheeled motor buses, railcars and trucks under contract with the Eight Wheel Motor Vehicle Co. of this city.

The bus is intended for interurban service and is designed for 24 passengers. The street car will have 31 passenger capacity and the trucks 4-tons and 7-tons, respectively. The experimental bus, built a year ago, is said to have demonstrated the advantage of eight-wheel construction, having run 13,000 miles over mountain roads. The four front wheels all steer while all four rear wheels are driven.

NEW DOSS TIRE

ATLANTA, Sept. 12—The Doss Rubber & Tube Co. announces the addition of a new standard size cord tire to its line, the factory now being in production on this tire. The Atlanta plant has been operating through August both day and night shifts.

Big Balance Shown by Lincoln Receiver

Reports That \$5,176,119 Is Remaining Awaiting Outcome of Federal Inquiry

DETROIT, Sept. 12—The report of the Detroit Trust Co., receiver for the Lincoln Motor Co., for the period dating from its appointment Nov. 8, 1921, to Aug. 1 this year, shows a balance of \$5,176,119 remaining in its hands awaiting the outcome of the investigation of the United States Department of Justice into the affairs of the original Lincoln Motor Co.

The report, filed in Federal Court, this city, states that the investigators of the department of justice have been housed in one of the Detroit office buildings so that there might be no interference with the operation of the Lincoln company by the Ford interests through their presence at the Lincoln offices.

Entire Period Covered

Two divisions are made in the report, one showing the activities of the receiver from the time the plant was taken over on Nov. 8 to the time of the sale, Feb. 4; the other showing activities since the sale to Aug. 1. While the plant was in the hands of the receiver there is shown a net loss of \$76,584, owing, it is stated, "to the necessarily limited production in order that business good will might be preserved and sold as a going concern."

Receipts of the receiver during the period of operation of the plant are shown as \$501,686, of which \$35,273 was taken over from the Lincoln Motor Co., \$61,280 collected on its accounts, and \$405,132 made as a result of receiver's operation. Payments on liabilities as of Nov. 8 were \$4,612 due to workmen, and a total of \$379,430 was paid out in the operation of the plant, leaving a cash balance of \$117,643 as a result of the receiver's operation.

Receipts since the sale of the plant, due to administration of ancillary receiverships and other activities, netted \$133,824, and disbursements were \$93,996, leaving a balance of \$157,471 from all sources independent of the amount received from the sale of the plant to the Ford interests.

Cash received and disbursements, and balance on hand Aug. 1 from the sale of the plant and assets to H. H. Emmons, representing Ford, is as follows: Received, \$8,097,401; disbursements, \$2,921,282, leaving a balance from this source of \$5,176,119, which is deposited at interest of 3 per cent pending the outcome of the government investigation. The principal disbursements made under order of the court from funds received from the sale of the plant were \$1,951,747 to meet mortgage obligations, and \$610,274 to the department of internal revenue.

Automobiles Recovered

The report, as part of its detail, shows the activity of the receiver in recovering automobiles which had been shipped to distributors in several sections of the country, who were financially unable to make payment for the cars. These led to ancillary receiverships in these sections, in which the cars were taken over and sold and the receipts handed to the receiver here.

Holmes Financing Action Deferred Until Sept. 16

CANTON, OHIO, Sept. 9—Stockholders of the Holmes Automobile Co., after a brief session this week, postponed action on the refinancing plans until Sept. 19, when another meeting will be held. The plan will be completed at that time, it is expected.

The stockholders will be asked to take action on the proposed sale of first mortgage refunding bonds to the amount of \$500,000 and on the proposed issue of 200,000 shares of capital stock, without par, to be exchanged for present outstanding stock.

Toledo Parts Plants Working Night Shifts

Nine Companies There Have Begun to Make Deliveries on New "Star" Contracts

TOLEDO, Sept. 11—With local automobile manufacturers working up to capacity, many of the subsidiary parts plants have had to put on night shifts to take care of outside business.

Nine Toledo industries making parts have begun to deliver on contracts for the new Star car being assembled by Durant Motors, Inc. Most of the plants here have contracts calling for delivery of 200,000 units by the first of the year.

The Toledo firms now at work on Durant contracts are: Electric Auto-Lite Co., starting and lighting systems; Tillotson Carburetor Co., carburetors; Nagel Electric Co., ammeters and oil gages; Landers Brothers' Co., webbing and upholstery materials; Edward Ford Plate Glass Co., windshields and glass for closed models; Mountain Varnish Co., finishes and varnishes; Acklin Stamping Co., sheet metal stampings; Doehler Die Castings Co., die castings, and Burt Foundry Co., castings.

Universal Machine Co., Bowling Green, and Adams Axle Co., Findlay, near here, also have large orders for parts.

Coal shortage has not yet affected the schedules of any of the Toledo motor plants. Most of them are dependent upon the Toledo Edison Co., which has been able to keep a small supply ahead, having contracts with West Virginia mines for a year's supply.

Bonus System Stimulates Greater Packard Output

DETROIT, Sept. 11—Packard announces that it still is far behind its orders, but with the factory working at top speed there has been an increase in production to the point where the August schedule for open cars now is being met in the total number of cars produced, although it is somewhat behind schedule in the number of closed cars. Full production of the various types of closed jobs should be reached by the latter part of September.

The new bonus system which gives added pay to all the members of each department in direct ratio to added production is given credit by the company for a big part in the increase in production that has been obtained. This increase has eased the situation in deliveries somewhat.

CADILLAC CLOSED CAR WEEK

DETROIT, Sept. 12—A national closed car week will be held by Cadillac distributors and dealers the week of Sept. 17 to 23. The idea for the closed car week was advanced by H. H. Rice, president of the Cadillac Motor Car Co. at the distributors' meeting held at the factory in the past week.

34,845 DURANTS PRODUCED IN 12 MONTHS, HALF OF THEM AT LONG ISLAND CITY PLANT

NEW YORK, Sept. 12—Production figures for the first 12 months of its existence show that Durant Motors turned out 34,845 Durant fours and sixes from August, 1921, to the end of August, 1922. This represents the work of five plants, with Long Island City accounting for half the product. The California plant began producing last month and since then 350 cars have been manufactured there.

June was the banner month, July showing a slump through the inability to get delivery on certain necessary parts.

The production table follows:

1921	Total	New York	Michigan	Canada	Indiana	California
August	14	14	..	..	..	..
September	64	64	..	..	..	..
October	288	288	..	..	..	..
November	661	661	..	..	..	..
December	1,477	1,296	176	..	5	..
1922						
January	2,510	1,624	877	..	9	..
February	1,618	1,093	424	..	101	..
March	3,099	1,663	767	150	519	..
April	3,737	1,836	851	436	614	..
May	5,104	1,967	1,878	525	734	..
June	5,886	2,587	2,191	341	767	..
July	4,789	2,224	1,931	173	461	..
August	5,598	2,657	2,148	153	290	350
Total	34,845	17,974	11,243	1,778	3,500	350

Associated Motors Assets, \$9,564,555

Balance Sheet Places Current
Liabilities July 15, 1922
as \$1,210,060

CHICAGO, Sept. 11—A condensed balance sheet of the Associated Motor Industries as of July 15, 1922, shows this holding company to have current assets of \$9,564,555 as compared with current liabilities of \$1,210,060. Cash is given at \$1,365,939.

The Associated Motor Industries was formed to effect the consolidation of approximately 20 companies active in the automotive or associated industries. These companies have been divided into three groups. The first group is made up of eight companies: National Motor Car & Vehicle Corp., Indianapolis; Traffic Motor Truck Corp., St. Louis; Recording and Computing Machines Co., Dayton, Ohio; Covert Gear Co., Lockport, N. Y.; Kentucky Wagon Manufacturing Co., Louisville, Ky.; Jackson Motors Corp., Jackson, Mich.; Saginaw Sheet Metal Works, Saginaw, Mich.; M. & T. Corp., Atlantic, Mass.

The identity of the companies included in the other two groups will be announced later. When all conveyances are completed, the Associated Motor Industries states that the combined assets will aggregate approximately \$80,000,000.

The aggregate depreciated value of the fixed assets derived from appraisal is given at \$10,135,378.

Rickenbacker Organizes Company to Finance Sales

DETROIT, Sept. 11—Rickenbacker Co., Inc., has been formed as a financing company for the Rickenbacker Motor Car Co. and will handle all financial business of the manufacturing company. This, according to B. F. Everitt, president of the manufacturing company, applies to the handling of sales and such other business as may arise from time to time.

The capital stock of the financing company is \$100,000 at \$10 a share; \$10,000 paid in cash. Stockholders are E. V. Rickenbacker, 260 shares; B. F. Everitt, 260 shares; R. M. Chambers, 160 shares; R. H. Hood, 160 shares and H. L. Cunningham, 160 shares.

FORD SHOW BRINGS ORDERS

ATLANTA, Sept. 11—The Atlanta branch of the Ford Motor Co. advises that actual gross sales at the South-eastern Fordson Industrial Exposition held here recently exceeded \$100,000 in signed orders obtained by dealers. Of this amount about 55 to 60 per cent represented Fordson tractors sold to industrial concerns; about 15 to 20 per cent sales for agricultural use, and about 25

BALANCE SHEET OF EIGHT MERGED COMPANIES SHOWS STANDING AS OF JULY 15, 1922

CHICAGO, Sept. 11—Associated Motor Industries has issued its condensed balance sheet as of July 15, 1922, showing the following current assets and current liabilities:

ASSETS	
CURRENT ASSETS:	
Cash	\$1,365,939.50
Accounts Receivable.....	922,719.89
Notes, Acceptances and Drafts.....	83,737.66
Investments	418,251.00
Inventories	6,773,907.17
TOTAL CURRENT ASSETS.....	\$9,564,555.22
FIXED ASSETS:	
Land, Buildings, Machinery and Equipment.....	\$13,515,848.35
Less:	
Depreciation	3,380,469.82
TOTAL FIXED ASSETS.....	10,135,378.53
PREPAID AND DEFERRED ASSETS:	
Insurance, Interest, Taxes, Etc.....	\$28,546.66
Supplies	75,540.06
Underwriting and Organization Expense (to be amortized).....	450,000.00
TOTAL PREPAID AND DEFERRED ASSETS.....	554,086.72
GOOD WILL AND PATENTS.....	1.00
TOTAL ASSETS.....	\$20,254,021.47
LIABILITIES	
CURRENT LIABILITIES:	
Open Accounts Payable.....	\$897,060.86
Notes Due 1/15/23.....	313,000.00
TOTAL CURRENT LIABILITIES.....	\$1,210,060.86
10-YEAR 7½ PER CENT FIRST MORTGAGE BONDS.....	3,000,000.00
DEFERRED LIABILITIES:	
10-Year Collateral Trust Gold Notes.....	\$2,700,000.00
Notes Due 7/1/23.....	762,036.08
Dealers' Deposits.....	80,102.50
TOTAL DEFERRED LIABILITIES.....	3,542,138.58
RESERVE FOR CONTINGENCIES.....	75,000.00
CAPITAL:	
Preferred 8 Per Cent Stock, 95,266 Shares, at \$100.....	\$9,626,600.00
Surplus Available for 181,732 Common No-par Value Shares	2,800,222.03
TOTAL	12,426,822.03
TOTAL LIABILITIES.....	\$20,254,021.47

to 30 per cent sales of other power farming machinery by southern distributors who had displays in connection with the exposition.

Anti-Truck Propaganda May Rouse Roads Bureau

WASHINGTON, Sept. 12—It is expected that the Bureau of Public Roads will call upon the various state highway commissions and good road organizations throughout the country to combat propaganda against motor truck transportation. Both manufacturers and owners of motor vehicles, especially trucks, are making vigorous protests against the methods adopted by electric railways to secure freight traffic which is now transported over the highways.

HENDEE REPORTS INCREASE

SPRINGFIELD, MASS., Sept. 11—Of the factory schedule of 20,000 motorcycles for the fiscal year ending Aug. 31, 1923, 22 per cent has been taken up in orders booked for the first month of this fiscal period, the Hendee Manufacturing Co. reports. There has been a sharp increase in new business and the company has booked orders for 2000 motorcycles and side cars for domestic use, while orders have been received for 1200 for Australia and 1000 for South Africa.

National Airplane Races to Feature Aero Congress

DETROIT, Sept. 12—More than 50 entries have been confirmed for the National airplane races to be held here Oct. 7, 12, 13 and 14. Pilots in the Army, Navy, Marine Corps and civil aviation will participate.

The races are a part of the Second National Aero Congress which will convene in Detroit on Oct. 12, 13 and 14 for the purpose of creating a permanent national aeronautic association. The feature will be the Pulitzer trophy event.

To date the Navy Bureau of Aeronautics has entered eleven seaplanes in the Curtiss Marine Trophy Race which will be held Oct. 7. The prize consists of a silver trophy donated by Glen Curtiss with accompanying cash prizes of \$1,200 for first, \$600 for second, and \$200 for third place.

The slogan at the Detroit congress and races is "Help Make America First In The Air."

MORE CADILLAC CLOSED CARS

DETROIT, Sept. 11—Statistics made public by the Cadillac Motor Car Co. show that in the last eight years Cadillac production of closed cars has increased from 7 per cent of the total to more than 54 per cent of the total.

Closed Type Demand Starts in Australia

Will Necessitate Imports—Farmers Entering Local Market on Large Scale

NEW YORK, Sept. 12—General business in Australia, has been on the increase since October, 1921, when the low point of the depression was reached. Since then the Australian farmer has come into the market, proving a greater factor in the buying movement than have the farmers in America, according to Peter McIntosh, managing director of McIntosh & Sons, Ltd., Sydney, distributor of Buick cars for the State of New South Wales who is spending a month in the United States and Canada on his tenth trip across the Pacific.

McIntosh says that his company is selling 60 per cent of its cars to farmers and that his monthly sales now are greater than during any other period since he entered the business.

America Holding Its Own

The American car is holding its own in New South Wales and Australia in general, the five and seven-passenger types being the large sellers with the five the leader. Only a few European makes are prominent on the market.

A recent development in the Australian automobile trade is the starting of a demand for closed types such as the sedan. This brings a new aspect into the Australian business in that while the local body-building concerns have produced practically all of the open bodies for the importer, none of them has built closed types. The limousines and other closed cars sold have been imported complete with the body. McIntosh believes that with the growing demand for sedan types it will be necessary to import these bodies for some time until the Australian body manufacturers get into production. In order to develop its body-building industry a duty of approximately \$375 on a five-passenger car was imposed, which made importation of bodies prohibitive except on the high priced cars.

Conditions Are Better

The present very pronounced improvement in car sales in Australia is largely due to the general betterment of conditions which largely depend on such staples as wool, wheat, meats, dairy products and minerals. The merino wool industry, which stands first, has made rapid advances. The good clip of 1921, together with higher prices has furnished ready money to the sheep raiser. Merino wool prices are as high as at any time in recent years, with the exception of the boom season caused by the war. The wool clip is generally moved between November and March and is invariably followed by a perceptible seasonal advance in business. The wheat crop was good and the price of approximately \$1.43 per bushel was most satisfactory,

as previous to the war New South Wales wheat had not brought more than \$1.

Conditions improved very materially in the dairy field, production being larger than in previous years. Business in the meat field has not been so good. The improvement in copper, zinc, and silver mines has assisted materially. This, coupled with the fact that money rates have come down, has greatly assisted in the financing of general business.

Good headway has been made in the introduction of motor buses not only in cities like Sydney and Melbourne but also over inter-city routes radiating from 12 to 20 miles out of the larger centers. British and European chassis are favorites in this field.

Road Improvement Would Help

Highway improvement will stimulate the use of motor buses as well as trucks, but unfortunately there is not what might be described a federal highway system for the Commonwealth. Present road-building laws turn the construction and maintenance over to municipalities, which means a general lack of broad planning. In spite of this, good macadam roads are being built each year from Sydney to Brisbane, a distance of 600 miles. Most of the highway is macadam and the remainder, gravel. From Sydney to Melbourne, 500 miles, there are about 300 miles of macadam and the balance gravel and bush roads. Approximately four other roads radiate from Sydney to interior points. From Sydney to Adelaide, 1200 miles, the highway is being improved in many sections.

The sale of motor trucks is not going ahead as might be expected, this being particularly true of the larger capacity vehicles. The present depression in the truck business is more or less due to high operating cost, gasoline selling at 60 cents an American gallon.

Although the truck business is slow, the farm tractor business is still slower, and the tractor is not taking hold of

(Continued on page 546)

Haynes Resumes Policy of Meetings of Dealers

KOKOMO, IND., Sept. 7—The new Haynes body models were exhibited here to-day at the first dealers' meeting held by this company in recent years. Dealer meetings are announced as a part of the policy of G. U. Radoye, who recently was placed in charge of both sales and advertising for the Haynes Automobile Co.

The morning session was devoted to the national advertising policy. Opportunities for connecting local sales situations with the national advertising were discussed at considerable length.

The economics of the present national crop manufacturing situation were considered, the conclusion being drawn that as a result of the third bumper crop in successive years and the recent rise in prices, the money is in the country and the dealers should be able to continue the present high rate of sales with less than the usual seasonal drops.

Plants Still Need Skilled Mechanics

Government Report Shows Shortage in Michigan—Factories Work Overtime

DETROIT GAINED 1094 IN WEEK

DETROIT, Sept. 9—A gain of 1094 for the week ended Sept 6 is reported by the Employers' Association, as against a loss of 5719 the preceding week. Total employment of the association members number 177,374, compared with 115,500 the same week last year.

WASHINGTON, Sept. 9—Though a slight decrease has been noted in the number employed in the automobile industry, the survey of industrial conditions for August as conducted by the United States Employment Service shows that there has been relatively little slowing up of manufacturing processes in the automobile industry.

There is a general shortage of skilled mechanics in the automotive industry in Michigan.

At Flint two automobile plants are working night shifts and in Kalamazoo automobile body factories are working overtime. Similar conditions prevail in Saginaw with several automobile plants.

Federal employment agents in Wisconsin report a slight decrease in employment in the automotive industry in Kenosha.

In Ohio, the automotive equipment industry has improved considerably. In Columbus one automotive plant now employs 700 men as against 230, six months ago.

Cleveland Employment Better

CLEVELAND, Sept. 12—Neither the rail nor coal strike has halted the activities of Cleveland industries.

The labor relations committee of the Cleveland Chamber of Commerce has reported to the Federal labor department that local factories increased their number of employees during August. They progressed steadily in production since the strikes began.

The strike of rail workers has helped motor transportation companies in the Cleveland district, particularly those handling freight.

During August the number of employees in Cleveland factories increased 5 per cent over July. Most of the increase was reported by the iron and steel factories and by those making metals and metal products other than iron and steel.

The automobile concerns here reduced their employees one-half of one per cent during August, which is said to be far below the usual seasonal falling off with the companies.

Men of the Industry and What They Are Doing

Sail to Attend Foreign Shows

The Paris and London automobile shows are calling to Europe a party of General Motors officials who have booked passage on the Olympic, sailing from New York Sept. 23. H. H. Rice, president of the Cadillac Motor Car Co., is one of the party, which also includes D. A. Laing, sales manager of the General Motors Export Corp.; G. A. DeWater of the Buick Motor Co.; E. A. Seaholm of the Cadillac; Charles R. Short, a General Motors research engineer; W. O. Kennington, of Delco-Remy, Ltd., of England, who is returning after a long visit in this country; and W. S. Gurley of the General Motors Acceptance Corp., who is being transferred from the New York office to the English branch.

Dixon and Oliver Join Quaker

J. M. Dixon and N. E. Oliver have been appointed directors of the Quaker City Rubber Co., Philadelphia. Dixon is president of the Tobacco Products Co. and a director in other corporations. Oliver, who has been identified with the rubber industry for 25 years, was formerly associated as a director with the Diamond Rubber Co. and later became general manager of the B. F. Goodrich Co. of New York, where he had charge of practically all of the eastern states.

Phelps Joins Barley

William Elliott Phelps has been appointed general sales manager for the Barley Motor Car Co. Until Aug. 1 he served as general sales manager of the Haynes Automobile Co.

F. D. Schulte Resigns

F. D. Schulte has resigned as body engineer and designer of the Stephens Motor Car Co., Freeport, Ill. He will take a three or four months' vacation trip to Europe. His plans after he returns home have not been announced.

Bassett Goes With Hyatt

A. F. Bassett has been appointed assistant sales manager of the motor bearings division of the Hyatt Roller Bearing Co. Bassett is a graduate of Yale Sheffield School and has been connected with the sales and engineering divisions of the company. Recently he has been sales engineer for the Detroit territory.

Rankin Appoints Barnes

Claire L. Barnes has been appointed director of merchandising for the William H. Rankin advertising agency. For some years he was secretary and sales manager of the Detroit Steel Products Co., a position which he left to become sales manager for the Billings & Spencer Co. of Hartford, Conn. Later he founded the Claire L. Barnes & Co. Sales

Corp. Relinquishing this enterprise, Barnes joined the Willys-Overland Co. as assistant to the president, John N. Willys, and then organized the Barnes Foundry & Manufacturing Co. of Detroit, for the manufacture of automobile accessories and parts. More recently he has been president of the Merchants Underwriting Corp. of New York, where his interests have been entirely taken up with industrial refinancing.

Lindsley Does Double Duty

A. M. Lindsley, engineer with the Alvord Reamer & Tool Co., Millersburg, Pa., has been placed in charge of the advertising department of that company. He will continue his work as engineer. Lindsley was formerly identified with the Cincinnati Milling Machine Co. of Cincinnati.

Williams Manages Autocar Branch

S. M. Williams, who for several years was in charge of the work of the Federal Highway Council in Washington, D. C., and who joined the Autocar Co., Ardmore, Pa., when the Federal Highway Council was abandoned, has been appointed manager of the company's New York City branch.

Brightman Appoints Dods

John P. Dods, for years associated with the Automobile Blue Book Publishing Co., has been appointed general manager of the Brightman Manufacturing Co., South Columbus, Ohio.

Robbins Joins Bearings Co.

A. W. Robbins, formerly of the Standard Roller Bearing Co. and the Bearings Service Co., now is associated with the Bearings Co. of America, and will travel from the Detroit offices of that concern.

Stone with Hoyt's Service

Earl B. Stone has joined the staff of Hoyt's Service, Inc., advertising agency, at its Cleveland office. Stone has had a very extensive sales and advertising experience for nine years, the last three and a half of which he spent with the Cleveland Tractor Co. as road salesman, assistant advertising manager, district sales manager and advertising manager.

LARGER WESTCOTT OUTPUT

SPRINGFIELD, OHIO, Sept. 12—Production at the plant of the Westcott Motor Car Co. will be increased the middle of September to a point that will make it the largest of any fall season in the company's history. Shipments during the past week were larger than in any week in August. Export orders were filled for Belgium, Greece, the Canary Islands and Venezuela.

Willys Returns Home After European Trip

Reports Competition Keen in England—Overland Doing Good Business Abroad

NEW YORK, Sept. 11—Returning on the Aquitania from a two months' visit to Europe, John N. Willys, president of the Willys-Overland Co., spent four days in New York, resuming contact with the American end of his business, then jumped on to the factory at Toledo. While here he denied positively the report of a new Overland to be brought out in November and expressed his satisfaction with things generally at Toledo, which reported July and August to have been two of the best months in Overland history for several years, with August producing more than 16,000 cars.

In speaking of conditions abroad, Willys said:

I found the competition keen indeed in England. Fiat is making a strong fight, while Citroen and one or two other French cars are bidding for English business. Overland is in fine shape to meet this competition in England through our plant at Manchester, where we will make 4000 cars this year for sale in Great Britain. We assemble the chassis at Manchester and fit them with English-built bodies which have been designed to fit English ideas.

We are doing nicely, too, in Belgium, Holland, Sweden, Norway, Denmark and Spain, with a small business in Switzerland. These Overlands come directly from this side.

Buying Power Increasing

Central Europe is quiet so far as the automobile business is concerned and I do not look for an improvement under present conditions. Germany seems to be getting what little business Central Europe has. The buying power of several European countries is unmistakably increasing, however. There is every indication of keen competition for the European automobile markets by European manufacturers. The retaliatory tariff policies of the various countries toward the United States is likely to make this competition a much more important factor in the export of automobiles than has generally been anticipated.

Before sailing for home, Willys was entertained at luncheon at the Hotel Cecil, London, at which many of the British dealers of Willys-Overland-Crossley, Ltd., were present. New prices for the English Overland were announced. The standard phaeton at £268 is an example of the new list.

Rhue Back From Trip

John A. Rhue, treasurer of the Indiana Truck Corp. has returned from an extended trip through Missouri, Kansas, Oklahoma and Texas. Rhue reports that he was impressed with the improvement in business and states that he anticipates a good fall and winter.

Willys Adjustment Plans Completed

May Declare 30 Per Cent Dividend on Approved Claims

TOLEDO, Sept. 11—A plan for the readjustment of the debt and capitalization of the Willys Corp., seeking to lift the final settlement out of the expensive judicial liquidation, has been received here and will probably be put into operation in the next few months.

Receiver Frank P. Kennison said that possibly a dividend on approved claims amounting to as much as 30 per cent may be declared in October.

The sale of the New Process Gear Corp. being delayed and a question of taxes arising between the Duesenberg Motors and the Government, has put back the plans for liquidation.

\$13,000,000 on Hand

The receivers had approximately \$13,000,000 from sales and liquid assets on hand when the receivership was put into effect. They also hold securities consisting of Fisk Rubber Co., Federal Rubber Co., Duesenberg Motors, and others, valued at \$3,888,800 and 750,000 shares of Willys-Overland common and \$750,000 in 4½ per cent notes given by the Willys-Overland Co., in satisfaction of claims. These assets are not to be liquidated at the present time.

The debt against the Willys Corp. totals \$18,000,000, of which \$10,000,000 represents indebtedness for moneys borrowed, more than \$2,000,000 for liquidated claims for machinery ordered, and a sum not to exceed \$1,600,000 estimated payable on claims which hold mechanics' liens. The remainder is accounted for in expenses of the receivership.

To effect the reorganization Percy H. Johnston, president of the Chemical National Bank; Howard Payne, president of the Columbia Trust Co., and Arthur W. Loesby, president of the Equitable Trust Co., all of New York, have been named a committee.

The proposed company to take over the assets enumerated above will float an issue of \$6,000,000 of 7 per cent notes maturing in three years. Probably not more than \$5,000,000 will be issued at the start. It will also have 200,000 shares of no par common stock.

New Stock for Claims

Mechanics' liens and expenses shall be paid in cash. Scrip dividend certificates issued on first preferred Willys Corp. stock will be taken at face value in purchase of notes or stocks purchased by holders of the old preferred.

All other claims proved will be settled by payment of \$700 in cash for each \$1,000 of claim and either \$300 in cash or \$300 in notes at 95 per cent of face and three shares of the new common stock, or a portion of cash or notes in the same relation.

BRITISH MAKER HOLDS "INSPECTION RALLIES"

LONDON, Aug. 28 (By Mail)—The maker of Arrol-Johnston cars this year has instituted a series of area "inspection rallies," publicly inviting all owners of their cars, especially those in the district, to attend, at an announced avenue, take refreshment as the maker's guests and allow their cars to be inspected and tried individually by a staff of testers on the spot.

Actual repairs are not done at these rallies, but a written report is furnished as to the "tune" of each car with recommendations as to what should be done to it if anything amiss is noticed. The object is, of course, to render an additional type of service to owners, and at the same time to secure publicity in an unusual form. Whether anything tangible is gained from either aspect it is hard to say; no doubt a proportion of owners are thus enlightened as to pending derangements and enabled to avoid trouble, but while the publicity gained by the firm is considerable, it is mainly local—apart from reports in the national motor press.

Holders of the first preferred stock may purchase for \$300 cash \$300 face of the three-year notes and three shares of the new common stock for each \$1,000 of old preferred stock. And in addition new common will be issued share for share with old first preferred. The purchase of the notes is entirely optional with the first preferred holder.

Holders of second preferred stock and common stock of the Willys Corp. will be allowed to purchase notes at the same ratio or in less amount according to their respective rights, but will not obtain any of the common stock of the new company in the distribution.

Voting Trust Named

To centralize control, the members of the reorganization committee are named a voting trust for the new common stock.

The new plan has been approved by the committees organized to protect the interests of the holders of bank and merchandise debt and representing the first preferred stockholders of the Willys Corp.

All claims will be first marshalled in the district in which they arise and then be filed with Special Master Curtice Johnson in Toledo. After approval by the local district court and ratification by each of the other districts, they will be eligible to receive the cash and securities of the new liquidating company.

The federal court here has approved the appointment of Brown, Hahn & Sanger and Cotton & Franklin, New York, as attorneys for the receivers in the dispute between the Willys-Overland and Willys Corp. settled a few weeks ago.

M.A.M.A. Expresses Optimistic Views

Predict General Prosperity with 1923 Biggest Year in History

BUFFALO, Sept. 13—Several widely known automotive executives have sent messages to the annual convention of the Motor and Accessory Manufacturers Association in session here, expressing highly optimistic views of the future of the industry. Some of those already received follow:

R. H. Collins, president of the Peerless Motor Car Co.—"In my opinion the automobile business is the finest business in the world. Present conditions in the trade are more than satisfactory to us, and I would have no hesitancy in predicting an even greater general prosperity in the future were it not for one fatal menace which threatens the industry to-day, namely, the growing tendency of the automobile distributors and dealers to place an exorbitant value on cars accepted in trade and to overestimate their ability to dispose of these cars at these fabulous prices.

"If this condition continues, the resultant suffering must be shared by the entire trade, including motor and accessory manufacturers and dealers, as well as automobile manufacturers and distributors."

H. H. Franklin—"Trade conditions are good and the outlook is bright."

J. J. Cole—"Our August shipments were 30 per cent greater than any month since January, 1921. We believe our shipments will be normal for the balance of the year. We see no reason why 1923 will not exceed any year in our history."

C. W. Nash—"It appears to me that prophecies made more than a year ago that business would gradually but surely improve to the point of having very prosperous times, are very rapidly being brought about. Barring the railroad and coal situations, I can see nothing to prevent 1923 being a splendid year in all lines of business. This is a time when courage and foresight should be used to the limit. If this is done, nothing but good results can follow, in my judgment."

Assets of Empire Tire Bought for \$1,675,000

TRENTON, N. J., Sept. 13—The assets of the Empire Tire & Rubber Corp. were sold by the receivers at a public sale to-day to Campbell, Heath & Co. of New York City for \$1,675,000. It was stated that the purchasers will form a company to operate the plant, with C. Edward Murray, Jr., as head of the concern.

W. W. Pepper, a former president of the rubber company, is treasurer of the brokerage firm, while William H. Peck, president of the Third National Bank of Scranton, represented the firm in the bidding.

Warm Wave Curtails Buying in Chicago

**Decline, However, Has Not Been
So Marked as to Cause Any
Great Depression**

CHICAGO, Sept. 8—A noticeable decline in the retail sales of automobiles in Chicago came with the last two weeks of August and the first few days of this month. It was coincident with a warm wave marked by the highest sustained temperature of the summer and most dealers are of the opinion that the coming of cooler weather, expected any day, will bring an improvement in sales.

The falling off of sales, however, has not been marked enough to cause any great depression in the business. There still are dealers far behind in making deliveries and there is an increasing demand for closed cars. Truck sales seem to have suffered more than passenger car sales. Used cars also have been moving more slowly, some dealers having difficulty disposing readily of cars taken in trade during the rush season.

Figures compiled by the Central Automobile Finance Association show the trend of sales here. These figures represent the number of time payment automobile sales recorded each week in Cook County and provide an index for the business generally. For the five weeks ending July 29 these sales were 4917, but for the five weeks ending Sept. 2 they dropped to 4467, a decline of 450. The last two weeks of the period ending Sept. 2 were responsible for practically all of this decline, the sales for those two weeks being 1576 as compared with 2017 for the final two weeks of the preceding period, a decline of 441.

Expect Big Fall Sales

The new models for the 1923 season being announced are attracting a great deal of attention as soon as they appear in the salesrooms and there is every reason to believe that the fall and winter selling will be exceptional. The Star car distributor placed two models of that car in his Michigan Avenue display room this week with the result that thousands of persons inspected it daily. The dealer is taking orders for delivery in January, requiring a \$25 deposit on the phaeton and \$50 on the closed models with an agreement to return the deposit if purchaser is not satisfied with the car after riding in it.

Sales of accessories and supplies have been exceptionally good during the summer and are still good. Important highway improvements in Illinois and Wisconsin have encouraged greater use of their cars by owners.

BIG GARDNER DEMAND

ST. LOUIS, Sept. 9—The Gardner Motor Co. reports a large demand for its new closed models, and production has been continuing at an increasing rate through the summer. Heavy shipments

OUTPUT FOR AUGUST PLACES MONTH SECOND IN PRODUCTION HISTORY OF INDUSTRY

NEW YORK, Sept. 12—With the figures 99 per cent complete, the National Automobile Chamber of Commerce reports that August production of passenger cars and trucks reached a total of 272,000, an increase of 12 per cent over July and 53 per cent over August of last year.

This makes this August the second greatest production month in the history of the industry, being topped only by June, 1922, with 289,000; May, 1922, had 256,000, and July, 246,000.

The following table shows the output by months of this year and the factory shipment figures for the first eight months of 1920, 1921 and 1922:

	Output		Carloads		Driveaways		Boat	
	1922	1920	1921	1922	1920	1921	1922	1920
January	90,486	20,057	6,485	15,357	29,283	3,185	7,479	93
February	129,500	25,505	9,986	19,636	43,719	7,507	10,173	99
March	173,342	29,236	16,287	27,753	57,273	9,939	16,917	75
April	218,546	17,147	20,187	31,334	64,634	14,197	22,381	1,619
May	256,000	21,977	18,608	33,416	74,236	15,193	28,827	2,381
June	289,000	22,516	20,269	34,230	60,746	18,834	33,857	8,350
July	246,000	23,082	19,514	28,412	52,342	15,533	28,022	8,702
August	272,000	23,386	20,350	32,563	34,060	14,290	36,603	7,095

Factory shipment for the other months of 1920 and 1921 follow:

	Carloads		Driveaways		Boat	
	1920	1921	1920	1921	1920	1921
September	20,804	20,150	24,431	13,550	5,469	3,580
October	17,209	17,323	14,127	11,257	2,519	2,300
November	13,253	14,061	9,497	10,509	659	1,385
December	11,802	12,100	6,469	7,500	89	134

have been made to the East and to the Pacific Coast. The southern market is reported just beginning to become active, with indications that the automobile business throughout the South will be better this fall than for a long time.

No Seasonal Slump as Midsummer Ends

(Continued from page 536)

selves with more ready cash than they had counted on and many of them are using some of it to buy much needed motor vehicles.

Few price adjustments remain to be made this year and there will be no "price war." Competition is keen but it is not likely to lead to foolish extremes. Balance sheets of car and parts makers show that they are prospering. Many companies which had suspended their dividends are resuming them and, with few exceptions, the year will show a substantial profit in the face of slowly mounting manufacturing costs.

New models have met with a cordial reception and several lines are finding it difficult to make deliveries. The closed car market continues excellent and it will be stimulated still further by the closed car shows which will begin soon.

The only cloud on the horizon for the industry at present is the freight jam which will not reach its peak for three or four weeks yet. There is no longer serious fear of being forced to curtail operations because of difficulty in obtaining coal.

Thacher Elected to Head Tire and Rim Association

HARTFORD, CONN., Sept. 13—S. P. Thacher of the United States Rubber Co. was elected president, at a meeting of the incorporators, of the Tire & Rim Association of America, Inc., which has taken over and will continue the activities of the Tire & Rim Association. The association includes in its membership representatives from the tire, rim, wheel and related parts industries.

John Younger of the Standard Parts Co. was named vice-president; C. A. Thompson, who will continue as general manager, secretary, and H. W. Kranz, treasurer. C. E. Bonnett will remain as chief rim inspector.

Directors for the association were elected as follows:

Tires—J. E. Hale, Firestone Tire & Rubber Co.; J. D. Anderson, Fisk Rubber Co.; W. A. Allen, B. F. Goodrich Co.; B. Darrow, Good-year Tire & Rubber Co.; E. O. Fitch, Hood Rubber Co.; C. F. Offensend, Miller Rubber Co. and S. P. Thacher.

Rims—J. H. Wagonhorst, Hayes Wheel Co.; W. B. Minch, Jackson Steel Products Co.; Ford Lawrence, Kelsey Wheel Co. and John Younger.

Wheels—T. Pleiss, Budd Wheel Co.; C. C. Carlton, Motor Wheel Corp and O. J. Rohde, Wire Wheel Corp. of America.

Related Parts—W. J. Kirkpatrick, A. Schrader's Son, Inc.

PIERCE-ARROW GAINS

BUFFALO, Sept. 14—The Pierce-Arrow Motor Car Co. reports sales and shipments for last month as greater than in any previous August and three times the amount for August, 1921. The company states that it is behind in production, especially of closed cars which total more than 70 per cent of its output.

Mexico Was Biggest Purchaser in July

Brazil Came Next, with Argentina and New Zealand Showing Increases

WASHINGTON, Sept. 11—A survey of the leading export markets for American automotive equipment, as shown by the July shipments from the United States, discloses that Mexico, Brazil, Argentina and New Zealand were the only large territories that increased their purchases over the month of June. Canada, Australia, Great Britain, Belgium and British South Africa each bought passenger cars in somewhat lessened volume than during June, the result being that passenger car exports as a whole decreased 24.4 per cent in value for July, according to the Automotive Division of the Bureau of Foreign and Domestic Commerce.

The comparative figures follow:

Mexico		
	Units	Value
July, 1922.....	652	\$382,726
June, 1922.....	563	369,531
July, 1921.....	787	532,429
Argentina		
July, 1922.....	217	223,994
June, 1922.....	113	96,128
July, 1921.....	3	3,000
Brazil		
July, 1922.....	240	201,179
June, 1922.....	90	91,507
July, 1921.....	7	12,397
New Zealand		
July, 1922.....	140	99,893
June, 1922.....	59	50,431
July, 1921.....	14	16,005

Unit values of the passenger cars shipped to these countries show that Argentina bought the highest priced cars, the unit value being \$1,032. Unit values to the other countries were \$838 for Brazil, \$712 for New Zealand and \$587 for Mexico.

Canadian Imports Less

Of the countries which took decreased shipments in July, Canada was the most important, reducing imports from 1807 cars in June to 891 in the latter month. Australian shipments fell from 816 to 663; Great Britain 775 to 523, and Belgium was from 699 to 522, and in South Africa from 203 to 156. The unit values to these countries were Canada \$941, Australia \$914, Great Britain \$891, Belgium \$447 and British South Africa \$1,038. Shipments to British South Africa were at a higher value than to any other country, the average being \$6 greater than for Argentina. Amount is not taken in these figures of the large car shipments from Canada.

The chief truck buyers were as follows:

Country	No.	Value	Unit Value
Belgium	170	\$38,031	\$223
Canada	117	225,697	1,929
Mexico	105	45,880	437
Japan	91	73,866	811
Brazil	58	66,915	1,153
Great Britain...	49	71,973	1,468

The total passenger car shipments to all countries, as was announced last week, were \$5,600, with a value of \$4,395,541 and a unit value of \$784. The unit value showed an increase of \$42 over June. The shipments of trucks to all countries were 822, valued at \$734,148 and a unit value of \$893, this being an increase in unit value of \$192.

A decrease of approximately 50 per cent was shown in motorcycle exports, but this was explained as being due to the fact that new models and prices are announced in early August and that consequently shipments slow down in July. A small gain was shown in the overseas sales of both airplanes and motorboats, but each of these items was small.

Closed Car Demand Starts in Australia

(Continued from page 542)

Australia as was anticipated. Fordson is carrying on a progressive selling campaign and one or two English makes are also pushing business.

The majority of the motor car tires used for replacement business are manufactured domestically, the three local Australian concerns producing perhaps 80 per cent. Since the advent of the cord tire most of the imported chassis are tire equipped. Australia is rapidly getting on what might be said to be a cord tire basis, and it is only a question of time until the straight side cord tire will be universal.

McIntosh has always been a strong advocate of standardization and is greatly pleased with what has been accomplished in this regard in the last few years. He feels that further standardization of small parts entering into the automobile would be a great advantage to the Australian trade, and naturally to the trade in other foreign countries. He would like to see bolts and nuts standardized to a much greater extent in the different makes of cars, thereby reducing the problem of servicing by cutting down the stocks of parts necessary to carry. Other small parts might similarly be standardized to a greater extent.

The automobile distributor in Australia has some financial problems to cope with that the American distributor is free from. One of these is that of financing time payments, there not being any large corporations in Australia which makes a specialty of this work.

WILL SELL URSUS PLANT

CHICAGO, Sept. 12—The receiver for the Ursus Motor Co. has advertised that written bids will be received until 10 a.m., Sept. 28, for the company's manufacturing plant at 6601-33 West Grand Avenue, Chicago. The plant was erected about two years ago, at a cost of \$165,000 for building and 15 acre site, for the manufacture of trucks, but was never operated to any extent. The machinery and equipment already has been sold by the receiver, Jacob Goldman of Chicago.

Tariff Bill Keeps 90 Per Cent Impost

House Conferees Accept Senate Amendment—Will Check Speculators' Efforts

WASHINGTON, Sept. 12—Protection for the American automotive industry is assured in the conference tariff report as submitted to the House to-day. One of the most important features of the tariff bill is the acceptance by the House conferees of the Senate amendment imposing a duty of 90 per cent foreign value upon motor vehicles, bodies, chassis and parts exported from this country prior to Feb. 11, 1919, for use during the war. The enactment of the provision will put a check to speculators who have bought this equipment abroad from taking unfair advantage of American producers and dealers.

The House bill provides that if any country imposes a duty on motor vehicles or parts when imported from the United States in excess of the American levy, there shall be placed an equal duty on similar articles imported from that country. This duty, however, is not to exceed 50 per cent, American value.

The conferees representing the House receded from their disagreement to the amendment imposing a duty of 10 per cent, foreign value, upon motorcycle tires, which under a House paragraph was dutiable at 30 per cent, American value, as finished parts of motorcycles.

Foreign value on motorcycles fixed by the Senate amendment is retained in the tariff bill, as the House conferees receded from their paragraph imposing a duty of 30 per cent, American value.

The bill which is now before the House contains the foreign valuation plan and the provision for flexible tariff rates to be declared by the President under certain conditions.

Textile Plant Operations Expected to Aid Trucks

SPRINGFIELD, OHIO, Sept. 12—Grayson Lathrop, director of the Kelly-Springfield Motor Truck Co., is making a business trip through the East, during which he will confer with the company's representatives at Philadelphia, New York City, Boston and Portland.

General Manager F. H. Peitsch states that as a result of the textile mills resuming operations the company expects to see a brisk trade in motor trucks from the New England states. The company is speeding up for a big increase in business this fall.

WEBB SUCCEEDS MC EVOY

DETROIT, Sept. 13—Earl W. Webb has been placed in charge of the Detroit office of the legal department of General Motors Corp., succeeding James McEvoy, now in charge of the patent section.

Latin America Has Few Excess Stocks

Retail Sales Should Be Upward,
Says J. D. Mooney, Back
from Tour

NEW YORK, Sept. 12—J. D. Mooney, vice-president and general manager of the General Motors Export Co., arrived here yesterday on the S. S. Santa Teresa, following a trip of nearly three months through Latin-America, in which he visited the principal automotive centers of Brazil, Uruguay, Argentina, Chile and Peru. Business conditions have improved materially through all sections of these countries, he declared, and the result is an expanding sale of automobiles and other automotive equipment.

"Nearly two years have passed since the depression began and in that time the excess stocks of cars and other equipment, except for a few pools here and there, have been liquidated," he said. "With retail sales improving, we may expect quicker reflection of these sales in orders to the factories here and, although I do not anticipate any revolutionary change in the automotive development, the curve of sales should be steadily upward."

Good Distributing Machinery

Mooney was frankly surprised at the extent of the distributing machinery already built up by the automotive industry in the various parts of Latin-America. Distributors, jobbers and dealers, he said, had in operation many excellent sales and service stations and were grappling with the service problem in a manner that should command the attention of the North American manufacturers.

"I was greatly impressed by the character and the energy of the men representing the automotive industry," he declared, "also by the capital invested in their plants, many of which are as large and as well equipped as the better places here at home. This was perhaps the most significant fact of my trip and it means that the automotive industry here must work more closely in a service way with our representatives there. We have often neglected this factor but it is one that deserves our closest attention."

Favorable Business Conditions

The favorable business conditions encountered by Mooney were summed up somewhat as follows:

Brazil has been stimulated greatly by better coffee prices and by the Centennial Exposition now under way.

Argentina and Uruguay are returning to normal as a result of higher prices and better demand for wheat and other products. In recent weeks, important advances have been effected in the cattle trade and this is removing the last stumbling block to further and more widespread prosperity.

Chile has been aided materially by bet-

ter demand for nitrates, copper and other native products. A similar improvement for native products has been effected in Peru.

Another point which greatly impressed Mooney concerned road development. Concerning this he said:

We have not yet realized in an automotive way the possibilities of the roads already built. In Rio de Janeiro I found many miles of good streets and pavement and the number of automobiles there is nothing like what it should be in view of this development. In São Paulo state, I drove for seven hours with scarcely a stop over the fine new road recently opened from São Paulo city to Ribeirão Preto, 263 miles into the interior. This was a good road, like many others in this section, particularly the road being built from São Paulo to Rio.

In Argentina, I found spotty road conditions, particularly near Buenos Aires. In the interior, however, although it was mid-winter when I was there, we had no trouble driving anywhere we wanted to go. Chile has a difficult road problem because of the mountains, but in Peru I was much struck by the fine road from Lima to Miraflores, recently built by an American company.

Lower Motoring Costs Needed

I did not find any general campaign under way over all of Latin-America for better roads, but I was much surprised to see how many motor roads are in good condition. Many more automobiles can be used on them than are now in operation.

What we must do to help out our representatives in the most practical way is to bring the cost of motoring down to as low a point as possible. Costs represent a more serious drawback than that of the highways. Cars cost much more in these countries than here; also, they are more expensive to operate. Closer cooperation in service work is one way in which operating costs can be brought down. Otherwise, we must evolve ways and means of making the landed price of our products as low as possible. Nothing else will so aid those energetic distributors and dealers who, despite their periods of discouragement, are hard at work trying to sell and handle our products.

Mooney's trip was eventful in that he saw a part of the recent abortive uprising in Rio de Janeiro and was marooned four days at Mendoza, Argentina, waiting for the snows to be cleared away to make the trans-Andean railroad passage into Chile. Also he narrowly averted a slight earthquake off Coquimbo, on the Chilean coast above Valparaíso.

Sioux City Reporting Business on Up Grade

SIoux CITY, Sept. 14—Automotive business is on the up-grade. Being fed from the farming section of three states—Iowa, Nebraska and South Dakota—business in the automotive lines has reacted with betterment of the farmers' condition. Some tractors are being sold, which seems to indicate that the buying power of the territory has been improved.

Light cars are finding a good market. Medium priced cars are a little slower, but sales in this class are increasing. Higher priced lines are moving very slow, but are for the most part cash sales. Sales in the lower priced cars have been mostly on the instalment plan.

Reports to N. A. C. C. Show Good August

Price Changes Stimulated Individual Sales But Retarded
Total Volume

NEW YORK, Sept. 14—Dealers' reports presented at the first meeting this fall of the directors of the National Automobile Chamber of Commerce indicate that August sales generally were much better than the previous month, and from 50 to 100 per cent better than August of last year. This condition prevailed except in a few states, which, however, represented no one section of the country. Where percentages of increases were given, they ranged from 9 to 30 per cent.

There is a general feeling on the part of the dealers that the effect of price changes has been to stimulate sales of cars where there had been reductions, but that they had retarded the volume of sales as a whole.

Light trucks are in much greater demand than heavy duty vehicles.

The used car market is reported as being very irregular, with some dealers stating it to be good and others dull.

Fall Prospects Good

Excellent conditions in the agricultural and industrial fields promise fairly good prospects for fall trade, although, at the same time, it is reasonable to suppose that there may be some decline in output.

Various committees reported progress made during the summer. The foreign trade committee states that its publicity campaign abroad, conducted in co-operation with the Department of Commerce, is having good effect with the result that there is an increasing number of inquiries being received. The committee on simplified practice is actively engaged in the preparation of data looking toward standardization of parts, spark plugs, starters, bearings and brake linings. The motor truck committee advised that it was getting inquiries from milk producers relative to the adoption of trucks for use in shipping. If the producers adopt trucks in place of railroads as a means of transportation, it will mean that 10,000 additional motor vehicles will be needed.

The drawing of space for both New York and Chicago shows will take place at the N. A. C. C. rooms on Thursday, Oct. 5 at 2 o'clock.

EXPECT 56,000 MAXWELLS

DETROIT, Sept. 14—Reports by the Maxwell Motor Corp. show that the closed car output is running 50 per cent of total production. From present schedules it is very likely that the company will reach its estimate of 56,000 cars as the total output for the year. The September schedule calls for 5500 cars and the last quarter, 13,500.

Ford Denies Coal Buying; Will Close

Declares Orders on Books War- rant Continued Operation of Plant

DETROIT, Sept. 13—Henry Ford in a statement to-day branded as a lie the report circulated from Cincinnati that the Ford company had purchased 4,000,000 tons of coal, deliveries on which are to begin at once. The publication, he said, was part of propaganda designed to cause coal buyers to scramble for coal at existing prices.

Earlier in the week it had been announced here that an agreement had been entered into between the Ford Motor Co. and the American Export & Inland Coal Co. of Cincinnati, by which Ford was assured an ample fuel supply for power purposes. With the tremendous buying power of the Ford company and the amount of the tonnage involved in the agreement, which was stated to be about 4,000,000 tons, it was estimated that the price paid per ton did not exceed \$4.50.

Ford failed to say anything about a reconsideration of the order closing the plants on Saturday next, and apparently the closing is to go through as scheduled. Preparations about the offices of the company and plant indicate that the closing will become effective and that the entire force of workmen will be laid off in a body.

It is reported that Ford Motor Co. has notified supply sources that it will close Saturday and remain closed two weeks.

The demand for cars is such as to warrant a continuance of operations at a normal rate, it is declared, and there will be many orders on the books when operations cease. This condition, however, is not borne out by the experience of the other companies. In the middle and low price field, which are finding a falling off in sales somewhat larger than might be termed seasonable. The other companies, however, have not begun to curtail factory operations.

Rail Situation

Failure of the fall business to hold up is declared to be wholly the result of the railroad situation. Farmers are unable to move their crops. Fruit growers have been badly hit, industrial districts are unable to get material and ship products in anything like quantities sought.

Places Million Dollar Order

DETROIT, Sept. 14—The Ford Motor Co. has placed an order for \$1,000,000 worth of brass for radiator parts with a Detroit manufacturer, deliveries to begin in 30 days.

MORE PULLMAN BODIES

CHICAGO, Aug. 28—Rapid increase in its production of automobile bodies is announced by the Pullman Co., builder of Pullman sleeping cars and other railroad equipment. This company for a

number of years has been building bodies on a limited scale for higher priced automobile.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Last week loans on call covered a range of 4 per cent to 4½ per cent, as compared with 3¾ per cent to 5 per cent in the previous week. Except a further slight hardening in the rates for shorter maturities, little change was noted in the time money market. Sixty and ninety days' maturities were quoted at 4½ per cent as compared with a range of 4¼ to 4½ per cent in the previous week. The rate for four, five and six months' maturities remained unchanged at 4½ per cent to 4¾ per cent. The stiffening in rates for the shorter maturities was ascribed to seasonal crop moving demands and, to a lesser extent, to preparation for September 15 tax payments. The prime commercial rate covered a range of 4 per cent to 4¼ per cent, as compared with 3¾ per cent to 4 per cent in the previous week.

Reported unfilled tonnage on the books of the United States Steel Corp. on Aug. 31 totaled 5,950,000 tons, against 5,776,000 tons on July 31, an increase for the month of 173,944 tons. Unfilled orders on June 30, 1922, totaled 5,636,000 tons; on May 31, 5,254,000, and on Aug. 31, 1921, 4,532,000 tons. The production of pig iron during August was affected by the blowing out, because of scarcity of fuel, of approximately 20 per cent of the iron furnaces previously in operation. The August output of 1,816,170 gross tons showed a decrease of 584,000 tons, slightly more than 24 per cent, from the July output and was the smallest amount produced in any month this year since February, but exceeded the August, 1921, output by 862,000 tons.

Commercial failures for the full calendar month of August, 1921, totaled 1669, the smallest number reported since September a year ago. This compares with 1568 in July and 1656 in June, which would indicate a comparative stabilization of business failures. Liabilities involved in the August failures amounted to \$36,829,000, the smallest amount reported for any month since early in 1920, and compares with \$42,146,000 in July, \$38,413,000 in June and \$50,382,000 in August, 1921. In August, 1919, failures reported for the month were 444 with liabilities at \$6,126,000.

Car loadings for the week ended Aug. 26, 1922, totaled 890,838 cars, an increase of 34,619 over the previous week and was the largest number reported for any week since Oct. 1, 1921. Although the loadings for the week ended Aug. 26 exceeded the corresponding week in 1921 by 61,955, it was a decrease of 110,470 over the similar week in 1920. Of the total amount, coal loadings totaled 111,030 cars, being an increase of 29,071 over the previous week, but a decrease of 48,483 over the corresponding week a year ago.

FINANCIAL NOTES

Stromberg Carburetor Co. of America reports net profits of \$192,328 for the quarter ended June 30, after charges and Federal taxes, or the equivalent of \$2.56 a share on 75,000 shares of capital stock outstanding, as against \$30,266 in the first quarter of the year, when earnings equal to 40 cents a share were reported. Profit and loss surplus June 30 showed \$2,657,549, as against \$2,465,221 for the quarter ending March 31. The consolidated balance sheet for the quarter ended June 30 shows gross earnings to be \$327,676, as against \$134,412 for the quarter ended March 31; net earnings after selling expenses \$241,465, as against \$41,946; cash, \$386,316, compared with \$299,431; notes and accounts receivable, \$474,101, as against \$326,701, and accounts payable, \$109,606, compared with \$78,981.

Stewart - Warner Speedometer Corp. announces that all of the \$2,000,000, 8 per cent notes due March 1, 1926 have been retired. Virtually the entire amount was converted into stock at the rate of 25 shares for each \$1,000 bond, the conversion, however, not increasing the outstanding capital stock, the company having purchased stock in the open market. It is reported that sales by the corporation for August were 103 per cent greater than for August of last year and that sales for the first eight months of the year have been in excess of the total for the whole of 1921.

Saxon Motor Car Corp. has issued a statement pointing out that the 200,000 shares of common stock offered for sale is the stock which was recently approved by the stockholders for issuance. It makes the outstanding common stock total 400,000 shares. A group of bankers has underwritten the entire new issue. An offering to stockholders by the syndicate is expected shortly. The proceeds of the sale will furnish additional working capital to round out the company's production program for the coming year.

Chandler Motor Car Co. has declared a regular quarterly dividend of \$1.50 a share on capital stock, payable to stock of record Sept. 20. Current earnings are more than covering dividend requirements, President F. C. Chandler stated following the directors' meeting, and business is better than expected at this season. The company has no debts other than current trade obligations.

Hayes Wheel Co. in its general balance sheet as of July 31 shows cash on hand of \$745,045; accounts and notes receivable \$1,531,727, making total current assets of \$3,764,609. Total current liabilities amounted to \$1,219,031, leaving a net working capital of approximately \$2,500,000.

Electric Storage Battery Co. has declared the usual quarterly dividends of 75 cents a share on the common and preferred stock, payable Oct. 2 to stockholders of record Sept. 15.

Allis-Chalmers Manufacturing Co. has declared a regular quarterly dividend of \$1.75 on the preferred stock, payable Oct. 16 to stock of record Sept. 25.

Spicer Manufacturing Co. has declared the regular quarterly dividend of 2 per cent on the preferred stock, payable Oct. 1 to stock of record Sept. 21.

Autocar Co., Ardmore, Pa., is offering \$1,000,000 new 8 per cent cumulative preferred stock at \$102.

Sao Paulo Highway Officially Opened

State Rapidly Pushing Ahead with
Road Plans—Decided
Impetus Given

SAO PAULO, BRAZIL, Aug. 19 (*By Mail*)—The 450 kilometer highway connecting this city with Ribeirao Preto, the center of the coffee district, has been officially opened, and the trip between the two cities is now being made by automobile in from eight to ten hours. This highway is a splendidly built extension of the Sao Paulo-Campinas road that was opened in 1921 and is the longest stretch of improved highway in all of Latin-America. Traversing the coffee-growing section and ending at its center, the new road is expected to inaugurate new and important motor transport developments.

A large automobile traffic over the road is assured, and undoubtedly many motor truck services will be put into operation over it. Travelers are making the trip to Ribeirao Preto by motor car in two hours less time than by train. Furthermore, recent increases in freight rates have raised rail transport costs so high that there is serious consideration of opening inter-city truck lines along the new road. Bus service in this district is yet in its infancy, but, nevertheless, it seems certain to come in the near future.

The state of Sao Paulo is rapidly pushing ahead with its road plans. Consul E. M. Lawton has just submitted a report to Washington, stating that about 800 kilometers of automobile highways were constructed in the state during the last year, and that approximately 5000 kilometers more are projected, designed to cover the whole state and to line up with similar roads in the adjoining states of Parana, Minas Geraes and Rio de Janeiro. Much of this work will consist of the improvement of existing roads and trails, but there will be considerable new construction.

Sentiment Favors Good Roads

"A decided impetus has been given to highway construction during the year 1921-1922," Consul Lawton states. "While the increasing use of motor cars has been largely responsible for this development, it is a fact that there is a growing sentiment in favor of good roads and more ready means of communication and transportation in the interior of the state, which is being fostered by the Good Roads Association, with the very valuable assistance of the State Governor, himself a devoted advocate of good roads."

Sao Paulo city is thus becoming the center of a very large network of roads, such as those leading to the seaport of Santos and to the interior city of Itu, about 100 kilometers inland. The new Ribeirao Preto road in time will be extended to Bello Horizonte, the capital and chief city of the rich mining and agricultural state of Minas Geraes. Ri-

beiro Preto is about half way to Bello Horizonte. Work is also continuing on the road being built from here in the direction of Rio de Janeiro, but its completion is not yet in sight. Pressure is being exerted to start the construction from Rio de Janeiro toward the state line, where it will connect with the Sao Paulo road.

Automotive conditions have improved materially, particularly in the accessory lines. Motor car sales are being made in larger volume, and some new agencies have recently been opened. European products do not figure largely in sales, except among certain standard accessories, but comparatively few Continental cars or tires are being sold here.

INDUSTRIAL NOTES

Nolte Screw Machine Products Co. receivership and the dissolution of the company are sought in a suit filed in the Common Pleas Court of Cincinnati by John L. Moorhead and August B. Luckey, secretary and second vice-president, respectively. Assets are estimated at \$57,000; liabilities, exclusive of the liability to stockholders, at \$12,000. The petitioners declare that the business cannot be continued at a profit because the company has no available capital other than that invested in its machinery and equipment. The company makes automatic screw machines.

Oilgear Co. of Milwaukee has opened a New York office at 39 Cortlandt Street in order to be in direct touch with the entire eastern territory. Russell, Holbrook & Henderson has been appointed sales representative for the district in and near New York City. Cadillac Machinery Co., Detroit, will handle the company's products in the state of Michigan, and R. E. Ellis Engineering Co., 621 Washington Boulevard, Chicago, will represent the Oilgear Co. in Chicago and surrounding territory.

Metropolis Bending Co., Cleveland, manufacturer of top bows, has succeeded the Union Bow Co., through which it has sold its product for many years. A. E. Puls, formerly in charge of the sales department of the Union Bow Co., has been appointed sales manager and assistant treasurer with headquarters in Cleveland.

Taylor Rubber Co., Ltd., has acquired a block of 48 acres of land in Aurora, Ont., is planning to erect a factory to which its manufacturing operations will be transferred. Engineers are at work on plans, but building has not yet commenced. The plant will have a capacity of 500 tires a day.

Martin-Parry Corp. reports sales of bodies about 75 per cent ahead of last year, with August sales about double last year. Although dollar volume is smaller than last year per body, total sales in dollars still is well ahead of 1921 because of increased production.

Diamond Chain & Manufacturing Co. has opened an office in the Leader-News building, Cleveland, in charge of H. I. Markey who has been with the company for five years as mechanical engineer in the engineering and sales departments.

Gordon Tire & Rubber Co., of Canton, Ohio has resumed operations after having been closed for one week for the making of necessary repairs. The plant will operate on a 50 per cent basis.

METAL MARKETS

Steel producers as well as consumers continue to grope their way in a market that seems to sellers, no less so than to buyers, beset with pitfalls for the unwary. Although producers profess reluctance to the booking of new business at the nominal quotations now prevailing, most of them would be only too happy to reinforce their backlog of orders at these prices if they were certain that in doing so they did not pass up opportunities that would come to them in the event of a further boosting of prices. Consumers show little concern over the price situation a month or three months hence. What they are interested in at this time are chiefly deliveries on account of previously placed contracts.

It is quite possible that with the acceleration of mill output resulting from improved fuel supply, reserve accumulations of steel in consumers' hands may exert considerable influence on the situation. Of course, amid the uncertainties of the good order car supply available for steel transportation, mill output may for some time to come run considerably ahead of receipts by consumers. Indications are not wanting that considerable tonnages of steel products have found their way into second hands and warehouses which would also be considerable of a market factor in the event that those who are holding it for an advance as the result of transportation difficulties should be disappointed and compelled to liquidate.

The outstanding development of the last few days has been announcement of a 5c. price by some interests for 22-gauge full-finished automobile body stock. This is really nothing more than an adjustment on the basis of the higher market for sheet bars. The 4.70c. quotation of the leading interest for this grade sheets which brought out quotations of up to 4.85c. by independent rollers dates from a \$35 sheet bar market. Now that sheet bars sell at nearer to \$40, the 5c. quotation for full-finished sheets was inevitable.

Pig Iron.—Although there is somewhat more activity, buying is still more or less of a retail character, with malleable enjoying the best inquiry. The Chicago market is on a \$32 base. On a Buffalo base No. 2 plain foundry continues quotable at \$34, furnace.

Steel.—Strip steel producers report having booked some business for fourth quarter delivery and are operating their plants at very close to capacity. They are holding down fourth quarter orders so that in the event of a further advance in the steel market generally they can sweeten the average of their fourth quarter sales, most of which are said to be on a 2.75c. base for hot-rolled and 4.25c. for cold-rolled. Delays in deliveries of hot-rolled bars are causing makers of cold-drawn steel bars much inconvenience. In some cases premiums for immediate shipments have been offered, but producers are more anxious to satisfy their regular customers than for extra profits on small tonnages that would upset their shipping schedules all around. The 10 per cent advance in bolt and nut prices forecasted in these reports has become general.

Aluminum.—The immediate effect of the closer approach of a new tariff law revealed through announcement of agreement between the Senate and House conferees has been to cause holders, whether importers, dealers or speculators, to conserve their stocks.

Copper.—Domestic consumers appear to be well covered and the market rules quiet.

Calendar

SHOWS

- Sept. 23-30—New York, Closed Car Show, Grand Central Palace.
- Oct. 7-14—New York, Electrical and Industrial Exposition, Grand Central Palace.
- Oct. 21-28—Washington, D. C., Annual Closed Car Salon, Convention Hall, under the auspices of the Washington Automotive Trade Association.
- Nov. 13-18—Chicago, Annual Show and Meeting of the Automotive Equipment Association.
- Dec. 3-9—New York, Eighteenth Annual Automobile Salon, Commodore Hotel.
- Jan. 6-13—New York, National Automobile Show, Grand Central Palace, under auspices of National Automobile Chamber of Commerce.
- Jan. 8-13—New York, Body Builders Show, Twelfth Regiment Armory, under the auspices of the Automobile Body Builders Association.

- Jan. 27-Feb. 3—Chicago, Annual Automobile Salon.
- Jan. 27-Feb. 3—Chicago, National Automobile Show, under auspices of National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

FOREIGN SHOWS

- Sept. 1922—Rio de Janeiro, Brazil, Automobile Exhibits in Connection with the Brazilian Centenary Association, Automobillista Brazilleria.
- Sept. 15-20—The Hague, Automobile Show.
- September—Buenos Aires, Argentina, Annual Exhibition, Sociedad Rural Argentina.
- Oct. 4-15—Paris, Automobile Show, Grand Palais.
- Nov. 3-11—London (Olympia), Automobile Show.
- Nov. 29-Dec. 4—London (Olympia), Cycle and Motorcycle Show, British Cycle Motors, The Tower, Warwick Road, Coventry.

- November—Buenos Aires, Argentina, Annual Exhibition, Automovil Club Argentino.

- Jan. 13-24—Brussels, Sixteenth International Automobile and Cycle Exposition, Palais du Conquanteaire.

CONVENTIONS

- Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.
- Oct. 2-7—Detroit, Fourth International Steel Exposition and Convention of the American Society for Steel Treating and the American Drop Forging Institute, General Motors Building.
- Oct. 7-14—Detroit, Second National Aero Congress and National Airplane Races.
- Oct. 9-11—Chicago, Annual Convention of the American Gear Manufacturers Association.
- Oct. 18-20—Chicago, National Association of Farm

Equipment Manufacturers, Congress Hotel.

- Oct. 26-28—Washington, Second National Conference for the Study of Highway Engineering and Highway Transport Education.

RACES

- Sept. 16—Kansas City Speedway, 300 mi. International Speed Race.

S. A. E. MEETINGS

- Sept. 16—Metropolitan Section, Annual Outing, West Point; Sept. 21—Automobile Club of America, George A. Round, Lubrication.
- Sept. 22—New England Section, Engineers Club, Boston, Starting and Lighting Equipment, Louis Ehrlich.
- Sept. 29—Detroit Section, Lubrication, A. A. Bull.
- Oct. 6—Aberdeen Proving Ground, Md.—Oct. 26-27, Detroit, General Motors Building.
- Jan. 9-12—New York, Annual Meeting.

Five French Makers Enter Truck Trials

PARIS, Sept. 1 (*By Mail*)—Trucks of 7½ tons load capacity will be presented by Berliet, Dewald, Renault, Saurer and Scemia in the French Army truck trials to begin at Versailles on September 26. These trials are open to French-built commercial type trucks of the indicated load capacity, capable of being adapted to army use in case of hostilities.

The successful vehicles have the privilege of being sold to private users with the guarantee of an annual subsidy for a period of three years. A load capacity of 7½ tons is required in order that these trucks can be used for the haulage of army tanks.

Following the truck trials, an army tractor competition will be held along the Chemin des Dames, north of Soissons, during the month of October. This is open to four wheel drive or creeper band type agricultural tractors, which can also be employed for the haulage of 75 and 155 mm. guns across country. Both light and heavy tractors are provided for.

The entrants in the heavy class are Citroen, Mistral and Renault, and in the light section Ara, Citroen, Mistral and Scemia. Use will be made by Citroen of the Kegresse type machine, which has rubber creeper bands. As in the case of the trucks, the successful tractors can be sold to farmers with the guarantee of a State subsidy.

No entries have been received for the 15 and 21 ton four wheel drive artillery tractors for use over roads. Last year only two makes entered the French trials and both failed to meet requirements.

NEW ENGLAND S. A. E. MEETING

NEW YORK, Sept. 14—Characteristics of present day automobile electric gen-

erators and starting motors will be described at the meeting of the New England section of the Society of Automotive Engineers in Boston, Sept. 22. L. B. Ehrlich, chief engineer of Gray & Davis, will present a paper in which he will describe method of voltage and current regulation, the types of winding and direct attention to the care and adjustment of electrical equipment in service. The meeting will be held at the Engineers Club, and a large representation of electrical service men is expected.

Gasoline Short Measure Crusade Brings Results

WASHINGTON, Sept. 11—The crusade against short measure selling of gasoline inaugurated by the National Motorists' Association has been started in earnest. The first shot produced results in that of 46 warrants sworn out in Louisville by the Louisville Automobile Club against managers of filling stations, six pleaded guilty and paid the fine of \$10 each that was imposed by Judge William Earl. These warrants followed a four day tour of inspection by the club in co-operation with the city inspector of weights and measures. At each station visited five gallons of gasoline were bought and it is said that there was an alleged shortage of measurement in each case.

Charges made by the National Motorists Association are that the average filching of short measure artists amounts to two pints in each five gallons, a daily loss to purchasers of 1,000,000 gallons, valued at approximately \$250,000, or \$90,000,000 a year. This is based on the assumption that each motorist buys two gallons of gasoline daily.

"No evidence has been found that the fraud is countenanced by the oil companies, and in fact offers of assistance are being received from such companies," says the N. M. A. in its statement.

122 Cu. In. Race Won by Bordino in Fiat

MILAN, ITALY, Sept. 10 (*By Cable*)—Bordino, driving a Fiat, won the Italian Grand Prix for cars of 122 cu. in. displacement, to-day, covering the 497 mi. of the Monza speedway at 86.8 m.p.h. His time was 5 hr. 43 min. 13 sec. F. Nazzaro, also in a Fiat, was second in 5 hr. 51 min. 45 sec. Viscaya, in a Bugatti, was given third place, although he did not finish, the crowd invading the track and stopping the race.

Bordino, who also won the 91 cu. in. race a week ago, went through without an engine stop, although two tire changes were necessary. Nazzaro experienced no tire trouble.

Of the 39 entrants only eight faced the starter, Bugatti withdrawing its team at the last moment, claiming its cars were not equipped with the right sort of wheels and tires for the race. This stirred up the crowd of 150,000, and the Bugatti drivers were threatened by the enthusiasts. Fiat offered to loan tires and wheels. This offer was accepted, and the race delayed half an hour to permit the change.

Three Cars Finish

Only three cars finished, one Fiat broke its transmission at the starting line; two German Heims quit at half distance and two Diattos were out at the three quarters.

Bordino's fastest lap was made at the rate of 91.5 m.p.h.

The inner track, 2½ mi. round, was used. It is very similar in design and layout to Indianapolis, so interesting comparisons can be made. The last Indianapolis race, at 500 mi., it will be remembered, was won by Murphy at 94.48 m.p.h. in a 183-in. car. The cars in the Italian race were of smaller displacement.

W. F. BRADLEY.